

ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

1. $P(x) = x + 4$, $Q(x) = x^2 - 5x \Rightarrow P(x) + Q(x) = ?$
 A) $x^2 - 4x$ B) $x^2 - 4$ C) $x^2 + 4x + 4$
 D) $(x - 2)^2$ E) $(x + 4)^2$

Çözüm / Solution:

$$\begin{aligned} P(x) + Q(x) &= \underbrace{x+4}_{P(x)} + \underbrace{x^2-5x}_{Q(x)} \\ &= x^2 - 4x + 4 \\ &= (x - 2)^2 \end{aligned}$$

Yanıt / Answer D

2. $(x^3 - 4x^2 + 3x) \cdot (x^2 - 5x + 1) = \dots + a \cdot x^4 + \dots$
 $\Rightarrow a = ?$
 A) -11 B) -10 C) -9 D) -8 E) -7

Çözüm / Solution:

$$\begin{aligned} (x^3 - 4x^2 + 3x) \cdot (x^2 - 5x + 1) \\ -5x^4 - 4x^4 = ax^4 \\ -9x^4 = ax^4 \\ a = -9 \end{aligned}$$

Yanıt / Answer C

3. $P(x - 4) = 2x^2 + 3x + 4 \Rightarrow P(1) = ?$
 A) 69 B) 70 C) 71 D) 72 E) 73

Çözüm / Solution:

$$\begin{aligned} P(x - 4) &= 2x^2 + 3x + 4 \\ \Rightarrow x - 4 &= 1 \Rightarrow x = 5 \\ P(5 - 4) &= 2 \cdot 5^2 + 3 \cdot 5 + 4 \\ &= 2 \cdot 25 + 15 + 4 \\ &= 50 + 15 + 4 \\ &= 69 \end{aligned}$$

Yanıt / Answer A

4. $P(x - 3) = x^3 + 2x^2 - x + a$, $P(-1) = 5 \Rightarrow a = ?$
 A) -10 B) -9 C) -8 D) -7 E) -6

Çözüm / Solution:

$$\begin{aligned} P(x - 3) &= x^3 + 2x^2 - x + a \\ x &= 2 \Rightarrow \\ P(2 - 3) &= 2^3 + 2 \cdot 2^2 - 2 + a \\ P(-1) &= 8 + 2 \cdot 4 - 2 + a \\ P(-1) &= 8 + 8 - 2 + a \\ P(-1) &= 14 + a \\ 5 &= 14 + a \Rightarrow a = -9 \end{aligned}$$

Yanıt / Answer B

5. $P(x^2) = x^4 - 1$, $Q(\sqrt{x}) = x + 1 \Rightarrow P(x) \cdot Q(x) = ?$
 A) $x^4 + 1$ B) $x^4 - 1$ C) $x^2 - 1$
 D) $x^2 + 1$ E) $x^5 - 1$

Çözüm / Solution:

$$\begin{aligned} P(x^2) &= (x^2)^2 - 1, & Q(\sqrt{x^2}) &= x^2 + 1 \\ P(x) &= x^2 - 1, & Q(x) &= x^2 + 1 \\ P(x) \cdot Q(x) &= (x^2 - 1) \cdot (x^2 + 1) \\ &= x^4 + x^2 - x^2 - 1 \\ &= x^4 - 1 \end{aligned}$$

Yanıt / Answer B

6. $m \in \mathbb{Z}^+$,
 $P(x) = x^{2m+2} + x^{2m+1} + 2 \Rightarrow P(-1) = ?$
 A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution:

$$\begin{aligned} P(x) &= x^{2m+2} + x^{2m+1} + 2 \\ P(-1) &= (-1)^{2m+2} + (-1)^{2m+1} + 2 \\ &= 1 + (-1) + 2 \\ &= 2 \end{aligned}$$

Yanıt / Answer A

7. $P(2-3x) = -2x^7 + 5x^3 + 2x^2 + 8 \Rightarrow P(5) = ?$
 A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution:

$$\begin{aligned} P(2-3x) &= -2x^7 + 5x^3 + 2x^2 + 8 \\ x &= -1 \Rightarrow \\ P(2-3 \cdot (-1)) &= -2 \cdot (-1)^7 + 5 \cdot (-1)^3 + 2 \cdot (-1)^2 + 8 \\ P(2+3) &= -2 \cdot (-1) + 5 \cdot (-1) + 2 \cdot 1 + 8 \\ P(5) &= 2 - 5 + 2 + 8 \\ &= 7 \end{aligned}$$

Yanıt / Answer E

8. $P(x) = 2x^4 - ax^3 + x^2 - (3+b)x + 1,$
 $Q(x) = (c+1)x^4 - 2x^2 + 2x + 3,$
 $P(x) + Q(x) = -x^2 + 4$
 $\Rightarrow a + b + c = ?$
 A) -7 B) -6 C) -5 D) -4 E) -3

Çözüm / Solution:

$$\begin{aligned} P(x) + Q(x) &= (c+1+2)x^4 - ax^3 - x^2 + (2-3-b)x + 4 \\ &= (c+3)x^4 - ax^3 - x^2 + (-1-b)x + 4 \\ (c+3)x^4 - ax^3 - x^2 + (-1-b)x + 4 &= -x^2 + 4 \\ c+3 &= 0, \quad -a = 0, \quad -1-b = 0 \\ c &= -3, \quad a = 0, \quad b = -1 \\ a+b+c &= 0 + (-1) + (-3) \\ &= -4 \end{aligned}$$

Yanıt / Answer D

9. $P(x, y) = 2x^2y^2 - 3xy^2 - 6x + 1 \Rightarrow P(3, \sqrt{2}) = ?$
 A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution:

$$\begin{aligned} P(3, \sqrt{2}) &= 2 \cdot 3^2 \cdot (\sqrt{2})^2 - 3 \cdot 3 \cdot (\sqrt{2})^2 - 6 \cdot 3 + 1 \\ &= 2 \cdot 9 \cdot 2 - 9 \cdot 2 - 18 + 1 \\ &= 36 - 18 - 18 + 1 \\ &= 1 \end{aligned}$$

Yanıt / Answer A

10. $P(x) = x^3 + ax^2 - bx + 1, P(1) = 10 \Rightarrow a - b = ?$
 A) 4 B) 5 C) 6 D) 7 E) 8

Çözüm / Solution:

$$\begin{aligned} P(1) &= 1^3 + a \cdot 1^2 - b \cdot 1 + 1 = 10 \\ 1 + a - b + 1 &= 10 \\ a - b &= 8 \end{aligned}$$

Yanıt / Answer E

11. $\left. \begin{aligned} P(x) &= x^4 - 5x^2 + 4 \\ Q(x) &= x^3 - 4x^2 + x + 6 \end{aligned} \right\} \Rightarrow \frac{P(x) - Q(x)}{(x^2 + 1) \cdot (x + 1)} = ?$
 A) $x - 1$ B) $x + 1$ C) $x - 2$
 D) $x + 3$ E) $x - 3$

Çözüm / Solution:

$$\begin{aligned} \frac{P(x) - Q(x)}{(x^2 + 1) \cdot (x + 1)} &= \frac{x^4 - 5x^2 + 4 - (x^3 - 4x^2 + x + 6)}{(x^2 + 1) \cdot (x + 1)} \\ &= \frac{x^4 - 5x^2 + 4 - x^3 + 4x^2 - x - 6}{(x^2 + 1) \cdot (x + 1)} \\ &= \frac{x^4 - x^3 - x^2 - x - 2}{(x^2 + 1) \cdot (x + 1)} \\ &= \frac{x^4 - x^2 - 2 - x^3 - x}{(x^2 + 1) \cdot (x + 1)} \\ &= \frac{(x^2 - 2) \cdot (x^2 + 1) - x(x^2 + 1)}{(x^2 + 1) \cdot (x + 1)} \\ &= \frac{(x^2 + 1) \cdot (x^2 - 2 - x)}{(x^2 + 1) \cdot (x + 1)} \\ &= \frac{x^2 - x - 2}{x + 1} \\ &= \frac{(x - 2) \cdot (x + 1)}{x + 1} \\ &= x - 2 \end{aligned}$$

Yanıt / Answer C

12. $P(x) = (2k - 1)x^3 + (k + 1)x^2 - x + k$,

$P(-2) = 36 \Rightarrow k = ?$

- A) -3 B) -2 C) 0 D) 2 E) 3

Çözüm / Solution:

$$\begin{aligned} P(-2) &= (2k - 1) \cdot (-2)^3 + (k + 1) \cdot (-2)^2 - (-2) + k \\ &= (2k - 1) \cdot (-8) + (k + 1) \cdot 4 + 2 + k \\ &= -16k + 8 + 4k + 4 + 2 + k \\ &= -11k + 14 \\ -11k + 14 &= 36 \\ -11k &= 22 \\ k &= -2 \end{aligned}$$

Yanıt / Answer B

13. $(x^2 + x + 1) \cdot P(x + 5) = x^3 - 1 \Rightarrow P(x) = ?$

- A) $x + 6$ B) $x - 5$ C) $x - 6$
D) $x + 5$ E) $x - 1$

Çözüm / Solution:

$$(x^2 + x + 1) \cdot P(x + 5) = x^3 - 1$$

$$P(x + 5) = \frac{x^3 - 1}{x^2 + x + 1}$$

$$P(x + 5) = \frac{(x - 1) \cdot (x^2 + x + 1)}{x^2 + x + 1}$$

$$P(x + 5) = x - 1$$

$$P(x - 5 + 5) = x - 5 - 1$$

$$P(x) = x - 6$$

Yanıt / Answer C

14. $m, n \in \mathbb{Z}^+$

$$4x^2 - mx + 4 = (2x - n)^2 \Rightarrow m + n = ?$$

- A) 10 B) 12 C) 14 D) 16 E) 18

Çözüm / Solution:

$$4x^2 - mx + 4 = (2x - n)^2$$

$$4x^2 - mx + 4 = 4x^2 - 4nx + n^2$$

$$-mx + 4 = -4nx + n^2$$

$$-m = -4n \text{ ve (and) } n^2 = 4, n = 2$$

$$n = 2 \Rightarrow m = 8 \Rightarrow m + n = 10$$

Yanıt / Answer A

15. $x^3 + ax^2 + bx + c = (x - 2) \cdot (x + 4) \cdot (x + 1)$

$$\Rightarrow a \cdot b \cdot c = ?$$

- A) 96 B) 108 C) 120 D) 132 E) 144

Çözüm / Solution:

$$\begin{aligned} x^3 + ax^2 + bx + c &= (x - 2)(x + 4)(x + 1) \\ &= (x^2 + 4x - 2x - 8)(x + 1) \\ &= (x^2 + 2x - 8)(x + 1) \\ &= x^3 + x^2 + 2x^2 + 2x - 8x - 8 \\ &= x^3 + 3x^2 - 6x - 8 \end{aligned}$$

$$x^3 + ax^2 + bx + c = x^3 + 3x^2 - 6x - 8$$

$$a = 3, b = -6, c = -8$$

$$\begin{aligned} a \cdot b \cdot c &= 3 \cdot (-6) \cdot (-8) \\ &= 144 \end{aligned}$$

Yanıt / Answer E

16. $P(x) = -3 \cdot x^{40} + 12 \cdot x^{20} - 12 \Rightarrow P(\sqrt[5]{2}) = ?$

- A) -768 B) -640 C) -612
D) -588 E) -542

Çözüm / Solution:

$$P(x) = -3 \cdot (x^5)^8 + 12 \cdot (x^5)^4 - 12$$

$$x = \sqrt[5]{2} \Rightarrow$$

$$P(\sqrt[5]{2}) = -3 \cdot \left((\sqrt[5]{2})^5 \right)^8 + 12 \cdot \left((\sqrt[5]{2})^5 \right)^4 - 12$$

$$= -3 \cdot 2^8 + 12 \cdot 2^4 - 12$$

$$= -588$$

Yanıt / Answer D

17. $P(2x + 5) = (2x^2 + 3x - 1) \cdot Q(x + 1)$

$$Q(-1) = 3 \Rightarrow P(1) = ?$$

- A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution:

$$P(2x+5) = (2x+3x-1) \cdot Q(x+1)$$

$$x = -2 \text{ için (for)}$$

$$P(2 \cdot (-2) + 5) = (2 \cdot (-2)^2 + 3 \cdot (-2) - 1) \cdot Q(-2 + 1)$$

$$P(1) = (2 \cdot 4 - 6 - 1) \cdot Q(-1)$$

$$P(1) = Q(-1)$$

$$P(1) = 3$$

Yanıt / Answer C

$$18. P(x) = ax^2 + bx + c, P(2) = 0, P(3) = 0$$

$$\Rightarrow \frac{a}{b} = ?$$

$$A) -\frac{1}{10} \quad B) -\frac{1}{5} \quad C) \frac{1}{5} \quad D) \frac{1}{10} \quad E) \frac{1}{2}$$

Çözüm / Solution:

$$P(x) = ax^2 + bx + c, P(2) = a \cdot 2^2 + b \cdot 2 + c$$

$$= 4a + 2b + c \Rightarrow 4a + 2b + c = 0$$

$$P(3) = a \cdot 3^2 + b \cdot 3 + c$$

$$= 9a + 3b + c \Rightarrow 9a + 3b + c = 0$$

$$4a + 2b + c = 0$$

$$-9a - 3b - c = 0$$

$$4a + 2b + c = 0$$

$$-5a - b = 0$$

$$-5a = b$$

$$\frac{a}{b} = -\frac{1}{5}$$

Yanıt / Answer B

$$19. P(x) = -x^2 + 3x, Q(x) = 5x^2 - x + 2$$

$$\Rightarrow P[Q(1)] + Q[P(-1)] = ?$$

$$A) 36 \quad B) 48 \quad C) 50 \quad D) 56 \quad E) 68$$

Çözüm / Solution:

$$Q(1) = 5 \cdot 1 - 1 + 2, \quad P(-1) = -(-1)^2 + 3 \cdot (-1)$$

$$Q(1) = 6, \quad P(-1) = -1 - 3$$

$$P(-1) = -4$$

$$P[Q(1)] + Q[P(-1)] = P(6) + Q(-4)$$

$$= -6^2 + 3 \cdot 6 + 5 \cdot (-4)^2 - (-4) + 2$$

$$= -36 + 18 + 5 \cdot 16 + 4 + 2$$

$$= -36 + 18 + 80 + 4 + 2$$

$$= 68$$

Yanıt / Answer E

$$20. P(x+3) = 2x^3 + ax^2 + x + 1, P(4) = 10 \Rightarrow a = ?$$

$$A) -6 \quad B) -2 \quad C) 2 \quad D) 6 \quad E) 10$$

Çözüm / Solution:

$$P(x+3) = 2x^3 + ax^2 + x + 1, \quad x = 1 \text{ için (for)}$$

$$P(1+3) = 2 \cdot 1^3 + a \cdot 1^2 + 1 + 1$$

$$P(4) = 2 + a + 2$$

$$P(4) = 4 + a$$

$$4 + a = 10$$

$$a = 6$$

Yanıt / Answer D

$$21. P(x^2 + 2) = x^8 + x^6 + ax^4 + 3$$

$$P(0) = 47 \Rightarrow a = ?$$

$$A) 7 \quad B) 8 \quad C) 9 \quad D) 10 \quad E) 11$$

Çözüm / Solution:

$$P(0) = 47$$

$$x^2 + 2 = 0 \Rightarrow x^2 = -2$$

$$P(-2+2) = (-2)^4 + (-2)^3 + a(-2)^2 + 3$$

$$47 = 16 - 8 + 4a + 3$$

$$47 = 11 + 4a$$

$$36 = 4a$$

$$a = 9$$

Yanıt / Answer C

$$22. P(x+1) - 5 = xP(x) + Q(x)$$

$$P(1) = 35$$

$$\Rightarrow Q(0) = ?$$

$$A) 30 \quad B) 37 \quad C) 42 \quad D) 47 \quad E) 55$$

Çözüm / Solution:

$$P(1) = 35$$

$$Q(0) = ? \Rightarrow$$

$$P(1) - 5 = 0 \cdot P(0) + Q(0)$$

$$35 - 5 = Q(0)$$

$$Q(0) = 30$$

Yanıt / Answer A

YÖS SORULARI / YÖS QUESTIONS

1. $P(x) = x^3 + 3x^2 + x$, $Q(x) = 5x^2 + bx + 1$
 $P(x) + Q(x) = x^3 + 8x^2 + 5x + 1 \Rightarrow b = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

(YÖS 1983)

Çözüm / Solution:

$$\begin{aligned} P(x) + Q(x) &= x^3 + 3x^2 + x + 5x^2 + bx + 1 \\ &= x^3 + 8x^2 + bx + x + 1 \\ &= x^3 + 8x^2 + (b+1)x + 1 \\ x^3 + 8x^2 + 5x + 1 &= x^3 + 8x^2 + (b+1)x + 1 \\ 5 &= b+1 \Rightarrow b = 4 \end{aligned}$$

Yanıt / Answer D

2. $P(x) = x + 1$, $Q(x) = x^2 + x$
 $\Rightarrow P(x) + Q(x) = ?$

- A) $x^2 - 2x$ B) $x^2 + 2x$ C) $(x-1)(x+1)$
D) $(x+1)^2$ E) $(x-1)^2$

(YÖS 1983)

Çözüm / Solution:

$$\begin{aligned} P(x) + Q(x) &= x + 1 + x^2 + x \\ &= x^2 + 2x + 1 \\ &= (x+1)^2 \end{aligned}$$

Yanıt / Answer D

3. $P(x) = x^2 + 5x - 3$, $Q(x) = x + 1$
 $\Rightarrow P[Q(-1)] + Q[P(2)] = ?$

- A) 14 B) 11 C) 9 D) -6 E) -4

(YÖS 1985)

Çözüm / Solution:

$$Q(-1) = -1 + 1 = 0, P(2) = 2^2 + 5 \cdot 2 - 3$$

$$P(2) = 4 + 10 - 3$$

$$P(2) = 11$$

$$P[Q(-1)] + Q[P(2)] = P(0) + Q(11)$$

$$= 0^2 + 5 \cdot 0 - 3 + 11 + 1$$

$$= -3 + 12 = 9$$

Yanıt / Answer C

4. $P(x) = ax^2 + bx + c$, $P(1) = 0$, $P(2) = 0$
 $\Rightarrow \frac{b}{a} = ?$

- A) 3 B) 2 C) 0 D) -2 E) -3

(YÖS 1986)

Çözüm / Solution:

$$P(1) = a \cdot 1^2 + b \cdot 1 + c = 0 \Rightarrow -1/a + b + c = 0$$

$$P(2) = a \cdot 2^2 + b \cdot 2 + c = 0 \Rightarrow \frac{4a + 2b + c = 0}{-a - b - c = 0}$$

$$+ \frac{4a + 2b + c = 0}{3a + b = 0}$$

$$b = -3a$$

$$\frac{b}{a} = -3$$

Yanıt / Answer E

5. $x^3 + ax^2 + bx + c = (x+2)(x-3)(x-1)$
 $\Rightarrow \frac{c}{a} = ?$

- A) 3 B) 2 C) 1 D) -1 E) -3

(YÖS 1988)

Çözüm / Solution:

$$x^3 + ax^2 + bx + c = (x+2)(x-3)(x-1)$$

$$= (x^2 - 3x + 2x - 6)(x-1)$$

$$= (x^2 - x - 6)(x-1)$$

$$= x^3 - x^2 - x^2 + x - 6x + 6$$

$$x^3 + ax^2 + bx + c = x^3 - 2x^2 - 5x + 6$$

$$a = -2, b = -5, c = 6, \frac{c}{a} = \frac{6}{-2} = -3$$

Yanıt / Answer E

6. $a, b \in \mathbb{R} \quad 4x^2 - 5x + b = (2x - a)^2$

$a + b = ?$

- A) $\frac{5}{4}$ B) $\frac{25}{8}$ C) $\frac{25}{16}$ D) $\frac{35}{8}$ E) $\frac{45}{16}$

(YÖS 1989)

Çözüm / Solution:

$$4x^2 - 5x + b = (2x - a)^2$$

$$4x^2 - 5x + b = 4x^2 - 4ax + a^2$$

$$-5 = -4a$$

$$a = \frac{5}{4}$$

$$b = a^2$$

$$b = \left(\frac{5}{4}\right)^2 \Rightarrow b = \frac{25}{16}$$

$$a + b = \frac{5}{4} + \frac{25}{16} = \frac{20}{16} + \frac{25}{16} = \frac{45}{16}$$

(4)

Yanıt / Answer E

7.
$$\begin{array}{r|l} 3x^3 - 2mx^2 - nx - 2 & x^2 - x - 2 \\ \hline & Q(x) \end{array} \Rightarrow m = ?$$

- A) -2 B) -1 C) 0 D) 1 E) 2

(YÖS 1999)

Çözüm / Solution:

$$3x^3 - 2mx^2 - nx - 2 = (x - 2)(x + 1) \cdot Q(x)$$

$$x = 2 \Rightarrow 24 - 8m - 2n - 2 = 0$$

$$\Rightarrow 11 = 4m + n$$

$$x = -1 \Rightarrow -3 - 2m + n - 2 = 0$$

$$\Rightarrow 2m - n = -5$$

$$4m + n = 11$$

$$2m - n = -5$$

$$6m = 6$$

$$m = 1$$

Yanıt / Answer D

8. $a \in \mathbb{N}$

$$\begin{array}{r|l} 5x^2 + 14x - 1 & x + a \\ \hline - \dots\dots\dots & \dots \\ & 2 \end{array}$$

$a = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

(YÖS 2005)

Çözüm / Solution:

$$x + a = 0 \Rightarrow x = -a$$

$$5(-a)^2 + 14(-a) - 1 = 2$$

$$5a^2 - 14a - 3 = 0 \Rightarrow (5a + 1)(a - 3) = 0$$

$$\Rightarrow a = -\frac{1}{5}, a = 3$$

$$a \in \mathbb{N} \Rightarrow a = 3$$

Yanıt / Answer D

9. $P(x) = (x + 1)(x^2 + cx) + x - 6$

$$Q(x) = x^3 - ax^2 + 4x + b$$

$$P(x) = Q(x)$$

$$\Rightarrow a + b + c = ?$$

- A) -8 B) -7 C) -6 D) 6 E) 7

(YÖS 2007)

Çözüm / Solution:

$$P(x) = (x + 1)(x^2 + cx) + x - 6$$

$$= x^3 + cx^2 + x^2 + cx + x - 6$$

$$= x^3 + x^2(c + 1) + x(c + 1) - 6$$

$$\begin{array}{l} -a = c + 1 \\ P(x) = Q(x) \Rightarrow 4 = c + 1 \Rightarrow a + b + c = -4 - 6 + 3 = -7 \\ b = -6 \end{array}$$

Yanıt / Answer B

$$1. \quad \left. \begin{aligned} d(P^3(x) \cdot Q^2(x)) &= 18 \\ d\left(\frac{P^3(x)}{Q(x)}\right) &= 9 \end{aligned} \right\} \Rightarrow d(P(x)) = ?$$

Yanıt / Answer : 4

$$2. \quad P(x^3 - 1) = 3x^2 - 4x + 1 \Rightarrow P(7) = ?$$

Yanıt / Answer : 5

$$3. \quad P(x+3) = x^3 + 2x^2 + x - 5$$

$$\Rightarrow \begin{array}{r|l} P(x) & x+1 \\ \hline & ? \end{array}$$

$$\begin{array}{r} -6x+32-5-5 \\ -73 \\ 32 \\ -41 \end{array}$$

Yanıt / Answer : -41

$$4. \quad \left. \begin{aligned} \frac{P(2x-1)}{Q(x+1)} &= 2x^2 - 3x + 1 \\ Q(0) &= 2 \end{aligned} \right\} \Rightarrow \begin{array}{r|l} P(x) & x+3 \\ \hline & ? \end{array}$$

Yanıt / Answer : 12

$$5. \quad P(2x-1) = x^4 - 3x^3 + 2x + a$$

$$\begin{array}{r|l} P(2x-1) & x-1 \\ \hline & 4 \end{array} \Rightarrow a = ?$$

$$\begin{array}{l} 2x-1=1 \\ 2x=2 \Rightarrow x=1 \\ 1^4 - 3 \cdot 1^3 + 2 \cdot 1 + a = 4 \\ 1 - 3 + 2 + a = 4 \\ a = 4 \end{array}$$

Yanıt / Answer : 4

$$6. \quad P(x-2) = x^5 - 2x^2 + 4x + 6$$

$$\Rightarrow \begin{array}{r|l} P(x) & x+3 \\ \hline & ? \end{array}$$

$$\begin{array}{r} -1-2-4+6 \\ -1 \end{array}$$

Yanıt / Answer : $x^2 - x + 8$

$$7. \quad (x-2) \cdot P(x) = x^3 - (2a-1)x^2 + 5ax - 16$$

$$\Rightarrow P(x) = ?$$

Yanıt / Answer : $x^2 - x + 8$

$$8. \quad Q(x) = 3ax + 3a - 12$$

$$\begin{array}{r|l} Q(x) & x-3 \\ \hline & 0 \end{array} \Rightarrow \begin{array}{r|l} Q(x) & x+3 \\ \hline & ? \end{array}$$

Yanıt / Answer : -18

$$9. \quad \left. \begin{array}{l} P(1) = 18 \\ \underline{\hspace{1cm}} \overline{P(x) \mid x+5} \\ \phantom{\underline{\hspace{1cm}}} 6 \end{array} \right\} \Rightarrow \underline{\hspace{1cm}} \overline{P(x) \mid x^2 + 4x - 5}$$

Yanıt / Answer : $4x + 14$

$$10. \quad \left. \begin{array}{l} \underline{\hspace{1cm}} \overline{P(x) \mid x-2} \\ \phantom{\underline{\hspace{1cm}}} -5 \end{array} \right\} \left. \begin{array}{l} \underline{\hspace{1cm}} \overline{P(x) \mid x+3} \\ \phantom{\underline{\hspace{1cm}}} -20 \end{array} \right\} \Rightarrow \underline{\hspace{1cm}} \overline{P(x) \mid x^2 + x - 6}$$

$$x = 2$$

Yanıt / Answer : $3x - 11$

$$11. \quad P(7x) = -21x + 11$$

$$\Rightarrow \underline{\hspace{1cm}} \overline{P(x) \mid x+5}$$

Yanıt / Answer : 26

$$12. \quad P(x-2) = Q(x+2) \cdot (x^2 - x - 2)$$

$$\underline{\hspace{1cm}} \overline{Q(x) \mid x-3} \Rightarrow \underline{\hspace{1cm}} \overline{P(x) \mid x+1}$$

Yanıt / Answer : 8

$$13. \quad \underline{\hspace{1cm}} \overline{P(x) \mid x^3 - 4x^2 + 3x} \Rightarrow \underline{\hspace{1cm}} \overline{P(x) \mid x-3}$$

Yanıt / Answer : 33

$$14. \quad \left. \begin{array}{l} P(3) = 6 \\ P(4) = 10 \end{array} \right\} \Rightarrow \underline{\hspace{1cm}} \overline{P(x) \mid x^2 - 7x + 12}$$

Yanıt / Answer : $4x - 6$

$$15. \quad P(x) = x^3 - 2x^2 + ax + b$$

$$\underline{\hspace{1cm}} \overline{P(x) \mid x^3 - 3x + 2} \Rightarrow a = ?$$

Yanıt / Answer : -5

$$16. \quad P(x) + P(2x) = 6x^2 + 12 \Rightarrow P(3) = ?$$

Yanıt / Answer : 24

1. $(2x + 1)^3 = 8x^3 + ax^2 + bx + c \Rightarrow a + b + c = ?$

- A) 12 B) 14 C) 16 D) 19 E) 21

2. $(x + 2) \cdot (x^2 + ax + 2b) = x^3 + 3x^2 + 5x + c + 2$
 $\Rightarrow 2a + c = ?$

- A) 5 B) 6 C) 7 D) 8 E) 9

3. $P(x) = 3x^5 - x - 1 \Rightarrow P(1) = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

4. $P(1 - x) = 2x^2 + 2 \Rightarrow P(x) = ?$

- A) $2x^2 - 4$ B) $2x^2 + 4x$ C) $2x^2 - 4x$
 D) $2x^2 + 4x + 4$ E) $2x^2 - 4x + 4$

5. $P(x - 2) = ax + b - 2a \Rightarrow P(2 - x) = ?$

- A) $-ax - b$ B) $ax - b$ C) $-ax + b + 2a$
 D) $-ax + 2b + a$ E) $ax - b + 2a$

6. $P(x - 2) = ax^6 - bx^3 + cx^2 - dx - 9$

$P(-3) = 6 \Rightarrow a + b + c + d = ?$

- A) 15 B) 16 C) 17 D) 18 E) 19

$a + b + c + d - 9 = 6$

7. $P(x^3 + 1) = x^8 + a \cdot x^6 - 3x^4 + 2$

$P(0) = 20 \Rightarrow a = ?$

- A) 20 B) 15 C) 10 D) 5 E) 2

$1 + a - 3 + 2 = 20$

8. $P(x) = x^7 + 4x + a, P(2) = 0 \Rightarrow a = ?$

- A) -136 B) -120 C) -90
 D) 136 E) 140

$128 + 8 + a = 0$

$a = -136$

9. $P(x + 2) = 2x^4 - 3x - 2$
 $Q(x) = 3x^2 - 2x + 2 \Rightarrow P(0) \cdot Q(0) = ?$

- A) 56 B) 64 C) 72 D) 76 E) 80

$32 + 6 - 2$

36

10. $P(x) = (3x - 4) \cdot Q(x) + 3, P(4) = 19 \Rightarrow Q(4) = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

11. $P(x-2) = (x-2) \cdot Q(x+2) + x+3$, $P(2) = 15$
 $\Rightarrow Q(6) = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

$15 = 2Q(6) + 7$
 $2 - Q(x+2) + 7 = 15$
 $Q(x+2) = -6$

12. $P(x) = ax + b \Rightarrow P(1) - P(2) = ?$

- A) $-a$ B) $-b$ C) $2b$ D) a E) b

$a + b - 2 + 2b$

$a + b - 2a - b$
 $-a - b$

13. $(x+3) \cdot P(x+3) + 2 = x^3 + ax + 5 \Rightarrow P(3) = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

$3P(4) = 3$

14. $P(x+1) = (x^2 + 2x - 1) \cdot Q(x) + x - 2$

$P(2) = 11 \Rightarrow Q(1) = ?$

- A) 2 B) 3 C) 4 D) 5 E) 6

15. $P(x+3) = x^3 - 2x - 3 \Rightarrow P(-2) = ?$

- A) -156 B) -144 C) -118
D) 118 E) 144

16. $P(x, y) = x^3 \cdot y - x^2 \cdot y^2 + 2 \cdot y^4$
 $\Rightarrow P(\sqrt{5}, -\sqrt{5}) = ?$

- A) -25 B) -5 C) 0 D) 5 E) 25

$-3^2 - 15 + 8$

17. $P(x^2) = x^4 + 5x^2 + 8 \Rightarrow P(-3) = ?$

- A) 1 B) 2 C) 3 D) -2 E) -3

18. $P(2x+1) = 2x+5 \Rightarrow P(x) = ?$

- A) $x+2$ B) $x+4$ C) $x+5$
D) $2x+1$ E) $x \cdot (x+3)$

19. $P(x) = 2x^2 - 2x + 1$

$P(x+2) = P(x-2) \Rightarrow x = ?$

- A) $-\frac{1}{4}$ B) $-\frac{1}{8}$ C) $\frac{1}{8}$ D) $\frac{1}{4}$ E) $\frac{1}{2}$

20. $P(x) = x^3 + 6x^2 + 12x + 8 \Rightarrow P(x-2) = ?$

- A) $x^3 + 2$ B) $x^3 + 8$ C) x^3
D) $x^3 - 2$ E) $x^3 - 8$

Yanıtlar / Answers

1. D	2. B	3. B	4. E	5. C	6. A
7. A	8. A	9. C	10. B	11. D	12. A
13. D	14. E	15. C	16. A	17. B	18. B
19. E	20. C				

1. $P(x) = x^2 + 2x$
 $Q(x) = x - 3$ $\Rightarrow P[Q(4)] + 2 \cdot Q[P(1)] = ?$

- ~~A) 0~~ B) 1 ~~C) 2~~ D) 3 E) 4

2. $P(2x+1) = 4x+5 \Rightarrow P(3) = ?$

- A) -1 B) 4 C) 5 D) 9 E) 11

3. $P(x+2) = 4x^3 + mx + 5$
 $P(4) = 51$ $\Rightarrow m = ?$

- A) 2 B) 4 C) 5 D) 6 E) 7

$$\begin{aligned} 32 + 2m + 5 &= 51 \\ 2m &= 14 \\ m &= 7 \end{aligned}$$

4. $P(x) = 2x^3 + (m-2)x^2 + 4x + 5$
 $P(x) = (x-3) \cdot Q(x) + 116$ $\Rightarrow m = ?$

- A) 4 B) 5 C) 6 D) 7 E) 8

$$P(3) = 116$$

$$116 = 54 + 9m + 18 + 17$$

$$116 = 9m + 81$$

5. $P(x+1) = x^3 - 4x^2 + x + m$
 $P(x+1) = (x-2) \cdot Q(x) + 10$ $\Rightarrow m = ?$

- A) 6 B) 10 C) 12 D) 16 E) 18

6. $P(x+1) = x^2 - 3x \Rightarrow P(x) = ?$

- A) $x^2 - 2x + 1$ B) $x^2 - 5x + 4$ C) $2x^2 - 6x + 3$
D) $x^2 - 4x + 2$ E) $x^2 - 5x - 2$

$$\begin{aligned} x-1 &= 2-3x+1 \\ x^2-2x+1 &= 2-3x+3 \\ x^2-5x+4 & \end{aligned}$$

7. $P(2x+4) = x^3 - 4x^2 + 1 \Rightarrow P(5) = ?$

- A) 1 B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{1}{8}$ E) $\frac{1}{64}$

$$\left(\frac{1}{2}\right)^3 - 4\left(\frac{1}{2}\right)^2 + 1 = \frac{1}{8} - 1 + 1 = \frac{1}{8}$$

8. $P(x) = 2\sqrt{2}x + 12 \Rightarrow P(\sqrt{2}) = ?$

- A) 5 B) 8 C) 16 D) $4\sqrt{2}$ E) $\sqrt{2}+12$

$$2\sqrt{2} \cdot \sqrt{2} + 12 = 4 + 12 = 16$$

9. $ax^3 + 2x^2 + bx + c = (x+1) \cdot (x-2) \cdot (x+3)$

$$\Rightarrow a+b+c = ?$$

- A) -9 B) -10 C) 13 D) 14 E) 21

10. $P(x, y) = 4x^2y^3 - 2x^2 + y^2x + 16 \Rightarrow P(-1, 1) = ?$

- A) -2 B) 7 C) 17 D) 19 E) 20

40/D

9 (19)

11. $P(x) = x^3 - ax^2 + bx + 7$
 $P(2) = 0$
 $P(1) = 4$
 $\Rightarrow a = ?$
 A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{7}{2}$ D) 4 E) 16

$15 - 4a + 2b = 0$
 $-2 + 4a + 2b + 7 = -8$
 $-2a - 1 = -8 \quad -2a = -7 \quad a = \frac{7}{2}$

12. $P(x) = 9x^2 + 8x$
 $Q(x) = 4x + 3$
 $\Rightarrow P[Q(2)] - Q[P(3)] = ?$
 A) 211 B) 105 C) 754 D) 801 E) 902

$9 \cdot 121 + 8 \cdot 15$
 $1089 + 120$
 1209
 425

13. $P(x) = 6x^2 + 4x + 3 + b$
 $P(x) = (x-1) \cdot Q(x) + 27$
 $\Rightarrow b = ?$
 A) 12 B) 13 C) 14 D) 15 E) 16

$6x^2 + 4x + 3 + b = (x-1) \cdot Q(x) + 27$
 $6x^2 + 4x + 3 + b = 27$
 $b = 19$

14. $P(x) = 2x^2 + 4x - 10 \Rightarrow P(-3) = ?$
 A) -5 B) -4 C) -3 D) -2 E) 6

$18 - 12 - 10 = -4$

15. $P(x) = 4x^2 + 7x - 8$
 $Q(x) = 3x^3 + 5x^2 - 4x - 7$
 $P(x) + Q(x) = T(x)$
 $\Rightarrow T(1) = ?$
 A) -2 B) -1 C) 0 D) 15 E) 24

16. $P(x-2) = 4x^3 + 5x^2 - 6 \Rightarrow P(-1) = ?$
 A) -4 B) 3 C) 2 D) 4 E) 12

$4 + 5 - 6$

17. $P(x) = 2x^2 + ax + b$
 $P(1) = 0$
 $\Rightarrow a + b = ?$
 A) -2 B) 4 C) 10 D) 12 E) 14

$2 + a + b = 0$

$a + b = -2$

18. $P(x+2) = 3x^3 + ax^2 + x + 1$
 $P(3) = 8$
 $\Rightarrow a = ?$
 A) 0 B) 1 C) 2 D) 3 E) 4

$5 + a + 1 = 8$
 $a = 2$

19. $P(x) = x^2 + 4x - 5$
 $Q(x) = 4 - 4x$
 $\Rightarrow \frac{P(x) + Q(x)}{(x-1)(x+1)} = ?$
 A) 0 B) 1 C) 2 D) 3 E) 4

Yanıtlar / Answers					
1. D	2. D	3. E	4. D	5. D	6. E
7. D	8. C	9. B	10. C	11. C	12. C
13. C	14. B	15. C	16. B	17. A	18. D
19. B					

1. $P(x+1) = x^2 - 4x + 5 \Rightarrow P(2-x) = ?$

- A) $x^2 - x + 2$ B) $x^2 + 2x + 2$ C) $x^2 + x - 2$
 D) $x^2 - x + 1$ E) $x^2 - 2x - 1$

$y+1 = 2-x \quad x=1$
 $x=1-x \quad x=-\frac{1}{2}$

2. $P(x-2) = x^2 + x - 6 \Rightarrow P(x+2) = ?$

- A) $x^2 + 9x + 14$ B) $x^2 + 7x + 7$ C) $x^2 - 9x - 14$
 D) $x^2 - 7x + 7$ E) $x^2 + 8x$

$x = y+4$
 $(y+4)^2 + y+4 - 6$
 $y^2 + 8y + 16 + y - 2$
 $y^2 + 9y + 14$

3. $P(x, y) = x^3 + 3x^2y + 3xy^2 + y^3$
 $\Rightarrow P(\sqrt[3]{4+2}, \sqrt[3]{4-2}) = ?$

- A) 64 B) 32 C) 16 D) 8 E) 4

$(\sqrt[3]{4+2})^3 + 3(\sqrt[3]{4+2})^2(\sqrt[3]{4-2}) + 3(\sqrt[3]{4+2})(\sqrt[3]{4-2})^2 + (\sqrt[3]{4-2})^3$
 $2 + 2 = 4$
 $2 \cdot 2 = 4$
 $2 \cdot 2 = 4$
 $2 + 2 = 4$
 $4 + 4 + 4 + 4 = 16$
 $16 \cdot 2 = 32$

4. $P(x, y) = x^2 - 4xy + 4y^2$

$\Rightarrow P(2\sqrt{2}, 2\sqrt{2}) = ?$

- A) 12 B) 8 C) 4 D) 2 E) 0

$(2\sqrt{2})^2 - 4(2\sqrt{2})(2\sqrt{2}) + 4(2\sqrt{2})^2$
 $8 - 32 + 32 = 8$

5. $P(x+2) = ax^5 + 6x^2 + 3x - 2$

$P(1) = 2a - 5 \Rightarrow P(3) = ?$

- A) 1 B) -1 C) -2 D) 5 E) 9

6. $P(x+1) = mx^2 + x + 1$

$P(0) = 3 \Rightarrow P(-1) = ?$

- A) 11 B) 10 C) 7 D) 5 E) 1

$m=3$
 $3x^2 + x + 1$
 $12 - 2 + 1 = 11$

7. $P(x+2) = -3x^4 + 2x^2 + 4x - 2$

$\Rightarrow P(1) - P(0) = ?$

- A) 43 B) 18 C) 8 D) 4 E) 2

$-3 + 2 - 4 - 2$
 -7
 $-48 + 8 - 8 - 2$
 -50

8. $P(2x-3) = -8x^3 + 2x + 4 \Rightarrow P(0) = ?$

- A) -28 B) -20 C) -12 D) -4 E) 8

$2x=3$
 $x=\frac{3}{2}$
 $-8(\frac{3}{2})^3 + 2(\frac{3}{2}) + 4$
 $-27 + 3 + 4 = -20$

9. $P(\frac{x}{2}) = 5x^5 + 4x^3 + 15x - 7$

$\Rightarrow P(0) = ?$

- A) -5 B) -6 C) -7 D) -8 E) -9

$\frac{x}{2} = 0$
 $x = 0$

10. $P(x-2) = \frac{x^2 - 5x - 8}{Q(2x-1)} - x$

$P(-1) = 23 \Rightarrow Q(1) = ?$

- A) 18 B) 7 C) -3 D) $\frac{1}{2}$ E) $-\frac{7}{2}$

11. $P(x-1) \cdot Q(x+3) = x^3 - 3x^2 - 4$
 $P(0) = -3 \Rightarrow Q(4) = ?$

- A) -3 B) -2 C) 0 D) 1 E) 2

$x^3 - 3x^2 - 4$

$-6 = 2$

12. $P(x-2) = 2x^2 - 3x - 6$
 $\Rightarrow P(\sqrt{2}) = ?$

- A) $-\sqrt{2} + 1$ B) $-3\sqrt{2}$ C) $2\sqrt{2}$
D) $4\sqrt{2} + 1$ E) $5\sqrt{2}$

$x-2 = \sqrt{2}$

$x = 2 + \sqrt{2}$

$2(2+\sqrt{2})^2 - 3(2+\sqrt{2}) - 6$
 $2(4+4\sqrt{2}+2) - 6 - 3\sqrt{2} - 6$

$8 + 8\sqrt{2} + 4 - 6 - 3\sqrt{2} - 6$

$5\sqrt{2}$

13. $P(x+1) = x^2 + x + 1$
 $\Rightarrow P(\sqrt{3}) = ?$

- A) $5\sqrt{3}$ B) $3+\sqrt{3}$ C) $2+\sqrt{3}$
D) $\sqrt{3}$ E) $4-\sqrt{3}$

$(\sqrt{3}-1)^2 + \sqrt{3} - 2 + 1$

$3 - 2\sqrt{3} + 1 + \sqrt{3}$

$4 - \sqrt{3}$

14. $P(x-2) = x^2 - 4x + 4$
 $\Rightarrow P(x+2) = ?$

- A) $x^2 + 4x + 4$ B) $x^2 - 3x + 4$ C) $x^2 - 2x - 3$
D) $x^2 + 4$ E) $x^2 - 5x + 3$

$x-2 = 2+2$

$x = 4$

$(x+2)^2 - 4(x+2) + 4$

$x^2 + 4x + 4 - 4x - 8 + 4$

$x^2 + 4x + 4$

15. $\frac{25x-9}{x^2-1} = \frac{A}{x-1} + \frac{B}{x+1}$
 $\Rightarrow A+B = ?$

- A) 5 B) 8 C) 12 D) 17 E) 25

$25x-9 = A(x+1) + B(x-1)$

16. $P(x) = x^2 - 3x + 1 \Rightarrow P(2x-4) = ?$

- A) $3x^2 - 8x - 7$ B) $4x^2 + 5x + 9$
C) $4x^2 - 22x + 29$ D) $5x^2 + 4x + 10$
E) $2x^2 + x + 17$

$(2x-4)^2 - 6x + 1$

$4x^2 - 16x + 16 - 6x + 1$
 $4x^2 - 22x + 17$

17. $P(3x+8) = 5x^2 + 3x - 4$

$\Rightarrow P(-1) = ?$

- A) 32 B) 24 C) 18 D) 8 E) 2

$3x+8 = -1$

$3x = -9$

$x = -3$

18. $P(1-x) = -3x + 5 \Rightarrow P[P(2)] = ?$

- A) 24 B) 26 C) 32 D) 48 E) 57

2

19. $P(2x+2) = x^2 + 1 \Rightarrow P(P(0)) = ?$

- A) -3 B) 1 C) 5 D) 8 E) 17

2

20. $\frac{-7x+7}{x^2-5x+6} = \frac{A}{x-3} + \frac{B}{x-2} \Rightarrow A+2B = ?$

- A) -5 B) 0 C) 7 D) 17 E) 20

Yanıtlar / Answers

1. B	2. A	3. B	4. B	5. E	6. A
7. A	8. B	9. C	10. D	11. E	12. E
13. E	14. A	15. E	16. C	17. A	18. B
19. B	20. B				

1. $P(x) = x^{\frac{n+12}{n}} + 5x^{n-4} + 3x + 1$

$P(x)$ bir polinomdur. ($P(x)$ is a polynomial)

$\Rightarrow \sum n = ?$

- A) 28 B) 24 C) 22 D) 18 E) 12

2. $P(x-3) = 2 \cdot (x-3)^6 - 2x^2 + 6x - 28$ eşitliği veriliyor.
Buna göre, $P(x)$ polinomunun katsayıları toplamı kaçtır? (What is the sum of the coefficients of $P(x)$?)
A) -34 B) -32 C) -16 D) 16 E) 36

3. $(x-1) \cdot P(x) = 7x^3 - 8x^2 + 4ax + 13 \Rightarrow P(x) = ?$
A) $7x^2 - 8x + 12$ B) $7x^2 - x - 13$
C) $7x^2 + x + 11$ D) $x^2 - 7x - 11$
E) $7x^2 - 3x - 2$

$7-8+4a+13$
 $4a = -12$
 $a = -3$

4. $P(x+3) = -x^3 + 6x^2 + ax + 7$
 $P(2) = -2$
 $\Rightarrow a = ?$

- A) -8 B) -2 C) 0 D) 8 E) 16

$1+6-a+7 = -2$
 $-1+6+a+7 = -2$
 14
 $a = -14$

5. $P(x) = 4x^3 + ax^2 + bx + 8$

$P(x) \mid x^2 - 1$
 $\Rightarrow a \cdot b = ?$

- A) -15 B) -6 C) 18 D) 27 E) 32

6.

$P(x) = ax^4 + 3bx^2 - 9x + 12$
 $P(x) \mid x^2 - 2x + 1$
 $\Rightarrow a + b = ?$

- A) 4 B) 8 C) 9 D) 12 E) 15

7.

$P(x) \mid x - 2$
 -1
 $P(x) \mid x + 3$
 -16
 $\Rightarrow P(x) \mid (x^2 + x - 6)$
 $?$

- A) $5x - 11$ B) $3x - 7$ C) $4x - 9$
D) $9x - 19$ E) $7x - 8$

8. $P(x) = x^6 + 8x^3 - 6x^2 + (n+2)x - 12$

$P(x) \mid x - 1$
 -2
 $\Rightarrow P(x) \mid x + 1$
 $?$

- A) 32 B) 24 C) -12 D) -24 E) -32

9. $Q(5x) = 125x^2 - 12$

$\Rightarrow Q(x) \mid x - 3$
 $?$

- A) 36 B) 33 C) 30 D) 27 E) 21

10. $P(3x-2) = (x^2 - 3x - 12) \cdot Q(x+5) - 4x + 12$

$P(x) \mid x - 1$
 36
 $\Rightarrow Q(x) \mid x - 6$
 $?$

- A) 6 B) 4 C) 0 D) -2 E) -9

11. $P(x) = x^3 + mx^2 + 3x - 2m$
 $P(x) = (x-2) \cdot Q(x) \Rightarrow m = ?$
 A) -3 B) -4 C) -5 D) -6 E) -7

12. $P(x+2) = Q(x-2) \cdot (x^2 + x + 2)$

$$\begin{array}{r} Q(x) \overline{) x-3} \\ \underline{-} \\ 4 \end{array} \Rightarrow \begin{array}{r} P(x) \overline{) x-7} \\ \underline{-} \\ ? \end{array}$$

- A) 128 B) 64 C) 48 D) 43 E) 16

13. $\frac{P(x-3)}{Q(x)} = x^2 - x - 4$

$$\begin{array}{r} Q(x) \overline{) x-5} \\ \underline{-} \\ 2 \end{array} \Rightarrow \begin{array}{r} P(x) \overline{) x-2} \\ \underline{-} \\ ? \end{array}$$

- A) 16 B) 18 C) 24 D) 28 E) 32

14. $P(1) = 12$

$Q(1) = 8$

$$\frac{x \cdot P(x-3) - a - 23}{Q(5-x) - 4} = 5 \Rightarrow a = ?$$

- A) 2 B) 3 C) 4 D) 5 E) 3

15. $2ax - P(x+1) = P(x+2) + x^2 - 7$

$$\left. \begin{array}{r} P(x) \overline{) x-2} \\ \underline{-} \\ 6 \\ P(x) \overline{) x-3} \\ \underline{-} \\ 10 \end{array} \right\} \Rightarrow a = ?$$

- A) 2 B) 3 C) 4 D) 5 E) 6

16. $P(x+2) = x^3 - ax^2 + 4x + b - 4$

$$\begin{array}{r} P(x) \overline{) x-2} \\ \underline{-} \\ 0 \end{array} \Rightarrow b = ?$$

- A) -9 B) -2 C) 0 D) 2 E) 4

17. $P(x-2) = x^3 + 4x^2 + (a+4)x - 16$

$$P(1) = 77 \Rightarrow \begin{array}{r} P(x) \overline{) x-2} \\ \underline{-} \\ ? \end{array}$$

- A) 152 B) 148 C) 136 D) 124 E) 118

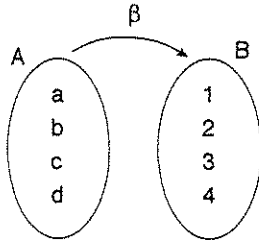
$$\left. \begin{array}{r} P(x) \overline{) x-3} \\ \underline{-} \\ 4 \\ Q(x) \overline{) x-3} \\ \underline{-} \\ 7 \end{array} \right\} \Rightarrow \begin{array}{r} P(x) \cdot Q(x) \overline{) x-3} \\ \underline{-} \\ ? \end{array}$$

- A) 12 B) 18 C) 28 D) 36 E) 56

19. $P(x) = (8x^2 - 6)^7 \cdot (2x + a)$ polinomu açılıp düzenlenirse katsayılar toplamı 1024 oluyor. Buna göre, a kaçtır?
 If sum of the coefficients of $P(x)$ is 1024, what is a ?
 A) 4 B) 6 C) 7 D) 8 E) 9

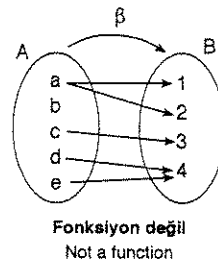
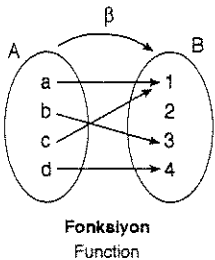
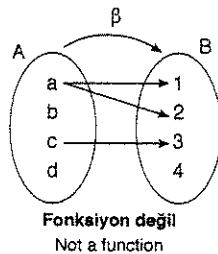
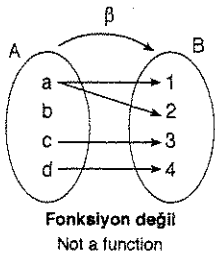
Yanıtlar / Answers

1. C	2. A	3. B	4. E	5. E	6. A
7. B	8. E	9. B	10. D	11. E	12. A
13. E	14. D	15. D	16. E	17. A	18. C
19. B					



Tanım: A' dan B' ye bir β bağıntısı A' nın her elemanını B' de bir ve yalnız bir elemanla eşliyorsa, β , A' dan B' ye bir fonksiyondur denir. A kümesine **tanım kümesi**, B kümesine **değer kümesi** denir.

Definition: If a relation β from the set A to set B makes an assignment to each number in the set A and assigns one number of A to only one number in the set B then β is called a function. Set A is called the domain and set B is called the range of the function.



BİRİM FONKSİYON / THE UNIT FUNCTION

$f(x) = x \Rightarrow f$ birim fonksiyondur. $I(x) = x$ ile gösterilir.

$f(x) = x \Rightarrow f$ is the unit function. It is denoted by $I(x) = x$

Örnek / Example :

$f(x) = (4-a)x + 2b + 6$ fonksiyonu birim fonksiyon ise **a+b toplamını bulunuz.**

If $f(x)$ is a unit function, what is $a+b$?

Çözüm / Solution:

$$4 - a = 1 \text{ ve (and) } 2b + 6 = 0$$

$$a = 3 \text{ ve (and) } b = -3$$

$$a + b = 3 + (-3) = 0$$



SABİT FONKSİYON / THE CONSTANT FUNCTION

$f(x) = c, c \in \mathbb{R} \Rightarrow f$ sabit fonksiyondur.

$f(x) = c, c \in \mathbb{R} \Rightarrow f$ is a constant function.

Örnek / Example :

$f(x) = (2a - b + 5)x^2 + 2bx + 1$ fonksiyonu sabit fonksiyon ise **a + b kaçtır?**

If $f(x)$ is a constant function, what is $a + b$?

Çözüm / Solution:

$$f(x) = (2a - b + 5)x^2 + 2bx + 1$$

$$2a - b + 5 = 0 \text{ ve (and) } 2b = 0 \Rightarrow 2a - 0 + 5 = 0$$

$$a = -\frac{5}{2} \Rightarrow a + b = -\frac{5}{2} + 0 = -\frac{5}{2}$$

Örnek / Example :

$f(x) = \frac{3x+a}{4x-8}$ sabit fonksiyon ise **a kaçtır?**

If $f(x)$ is a constant function, what is a ?

Çözüm / Solution:

$$\frac{3x+a}{4x-8} = k$$

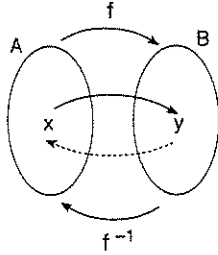
$$3x + a = 4kx - 8k \Rightarrow 4k = 3, a = -8k$$

$$k = \frac{3}{4} \quad a = -8 \cdot \frac{3}{4} \Rightarrow a = -6$$



TERS FONKSİYON / THE INVERSE FUNCTION

$$f: A \rightarrow B ; f^{-1}: B \rightarrow A$$



$$f(x)=y \Rightarrow f^{-1}(y)=x$$

$$f^{-1} \neq \frac{1}{f}$$

Örnek / Example :

$$y = f(x) = 2x - 5 \Rightarrow f^{-1}(x) = ?$$

Çözüm / Solution:

$$y = 2x - 5$$

$$x = 2y - 5$$

$$x + 5 = 2y$$

$$\frac{x+5}{2} = y$$

$$f^{-1}(x) = \frac{x+5}{2}$$

Örnek / Example :

$$y = f(x) = \frac{2x-4}{x+4} \Rightarrow f^{-1}(x) = ?$$

Çözüm / Solution:

$$y = \frac{2x-4}{x+4}$$

$$x = \frac{2y-4}{y+4}$$

$$xy + 4x = 2y - 4$$

$$xy - 2y = -4x - 4$$

$$y(x-2) = -4x - 4$$

$$y = \frac{-4x-4}{x-2} = \frac{4x+4}{2-x}$$

$$f^{-1}(x) = \frac{4x+4}{2-x}$$

Örnek / Example :

$$f\left(\frac{x-2}{2x}\right) = 2x+5 \Rightarrow f^{-1}(3) = ?$$

Çözüm / Solution:

$$f\left(\frac{x-2}{2x}\right) = 2x+5$$

$$(y=f(x) \Leftrightarrow f^{-1}(y)=x)$$

$$\frac{x-2}{2x} = f^{-1}(2x+5) \quad \left(\begin{array}{l} 2x+5=3 \\ x=-1 \end{array} \right)$$

$$x=-1 \Rightarrow \frac{-1-2}{2 \cdot (-1)} = f^{-1}(-2+5)$$

$$\frac{-3}{-2} = f^{-1}(3)$$

$$f^{-1}(3) = \frac{3}{2}$$

Örnek / Example :

$$f(x) = x^2 - 2x \Rightarrow f^{-1}(x) = ?$$

Çözüm / Solution:

$$y = x^2 - 2x$$

$$x = y^2 - 2y$$

$$x = y^2 - 2y + 1 - 1$$

$$x = (y-1)^2 - 1$$

$$x+1 = (y-1)^2$$

$$\pm\sqrt{x+1} = y-1$$

$$\pm\sqrt{x+1} + 1 = y$$

$$f^{-1}(x) = \sqrt{x+1} + 1$$

Örnek / Example :

$$f: \mathbb{R} \rightarrow \mathbb{R}, f(2x-4) = 8x+5 \Rightarrow f(x) = ?$$

Çözüm / Solution:

$$f(2x-4) = 8x+5$$

$$f\left(2 \cdot \left(\frac{x+4}{2}\right) - 4\right) = 8 \cdot \left(\frac{x+4}{2}\right) + 5$$

$$f(x+4-4) = 4 \cdot (x+4) + 5$$

$$f(x) = 4x + 21$$



TERS FONKSİYONUN ÖZELLİKLERİ PROPERTIES of INVERSE FUNCTIONS

- a. $f(x) = x + a \Rightarrow f^{-1}(x) = x - a$
- b. $f(x) = \frac{ax+b}{c} \Rightarrow f^{-1}(x) = \frac{cx-b}{a}$
- c. $f(x) = \frac{a}{bx+c} \Rightarrow f^{-1}(x) = \frac{-cx+a}{bx}$
- d. $f(x) = ax+b \Rightarrow f^{-1}(x) = \frac{x-b}{a}$
- e. $f(x) = \frac{ax+b}{cx+d} \Rightarrow f^{-1}(x) = \frac{-dx+b}{cx-a}$
- f. $f(x) = \frac{ax+b}{cx} \Rightarrow f^{-1}(x) = \frac{b}{cx-a}$
- g. $f(x) = a-x \Rightarrow f^{-1}(x) = a-x$
- h. $f(x) = \frac{b}{x} \Rightarrow f^{-1}(x) = \frac{b}{x}$
- k. $f(x) = a^x \Rightarrow f^{-1}(x) = \log_a x$
- l. $f(x) = \log_a x \Rightarrow f^{-1}(x) = a^x$

Örnek / Example :

$$f^{-1}(2x+4) = x \Rightarrow f\left(\frac{2}{x}-1\right) = ?$$

A) $\frac{2}{x}-2$ B) $\frac{2}{x}+2$ C) $\frac{4}{x}+2$

D) $\frac{4}{x}+4$ E) $\frac{8}{x}+2$

Çözüm / Solution:

$$f^{-1}(2x+4) = x$$

$$f(x) = 2x+4$$

$$f\left(\frac{2}{x}-1\right) = 2 \cdot \left(\frac{2}{x}-1\right) + 4$$

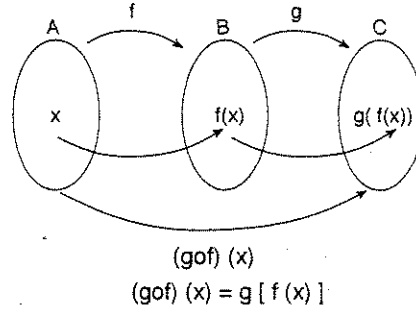
$$f\left(\frac{2}{x}-1\right) = \frac{4}{x} - 2 + 4$$

$$f\left(\frac{2}{x}-1\right) = \frac{4}{x} + 2$$

Yanıt / Answer C



BİLEŞKE FONKSİYON / COMPOSITE FUNCTION



☞ (fog)(x): f fonksiyonundaki x lerin yerine g(x) konulur.

Insert g(x) instead of x in f(x).

☞ (gof)(x): g fonksiyonundaki x lerin yerine f(x) konulur.

Insert f(x) instead of x in g(x).

Örnek / Example :

$$f(x) = 3x - 4, \quad g(x) = 4x + 6$$

$$(fog)(x) = ? , (gof)(x) = ?$$

Çözüm / Solution:

$$(fog)(x) = f(g(x)) = 3 \cdot g(x) - 4$$

$$= 3 \cdot (4x+6) - 4$$

$$= 12x+18-4$$

$$= 12x+14$$

$$(gof)(x) = g(f(x)) = 4 \cdot f(x) + 6$$

$$= 4 \cdot (3x-4) + 6$$

$$= 12x-16+6$$

$$= 12x-10$$

Örnek / Example :

$$f(x) = x^2 - 2, \quad g(x) = 2x - 4$$

$$h(x) = 3x-1 \Rightarrow (fogoh)(x) = ?$$

Çözüm / Solution:

$$(fogoh)(x) = f(g(h(x)))$$

$$= f(g(3x-1))$$

$$= f(2 \cdot (3x-1) - 4)$$

$$= f(6x-6)$$

$$= (6x-6)^2 - 2$$

$$= 36x^2 - 72x + 36 - 2$$

$$= 36x^2 - 72x + 34$$



BİLEŞKE FONKSİYONUN ÖZELLİKLERİ COMPOSITE of INVERSE FUNCTIONS

1. $f \circ g \neq g \circ f$
2. $(f \circ g) \circ h = f \circ (g \circ h)$
3. $(f \circ g)^{-1}(x) = (g^{-1} \circ f^{-1})(x)$
4. $(f^{-1} \circ f)(x) = (f \circ f^{-1})(x) = I(x)$
5. $(f \circ I)(x) = (I \circ f)(x) = f(x)$
6. $(f \circ g)(x) = h(x) \Rightarrow g(x) = f^{-1}(h(x))$
7. $(f \circ g)(x) = h(x) \Rightarrow f(x) = h(g^{-1}(x))$

Örnek / Example :

$$f(x) = 3x - 1$$

$$(g \circ f)(x) = 9x + 5$$

$$\Rightarrow g(x) = ?$$

Çözüm / Solution:

$$f(x) = 3x - 1, (g \circ f)(x) = 9x + 5$$

$$(g \circ f)(x) = 9x + 5 \Rightarrow g(x) = 9 \cdot f^{-1}(x) + 5$$

$$g(x) = 9 \cdot \frac{x+1}{3} + 5$$

$$= 3(x+1) + 5$$

$$= 3x + 8$$

Örnek / Example :

$$f(x) = \begin{cases} 2x+5 & ; x < -1 \\ 2-x^2 & ; x \geq 1 \end{cases}$$

$$g(x) = 3 - x \Rightarrow (f \circ g)(5) = ?$$

Çözüm / Solution:

$$(f \circ g)(5) = f(g(5))$$

$$= f(3-5)$$

$$= f(-2)$$

$$= 2 \cdot (-2) + 5 \quad (-2 < -1)$$

$$= 1$$

Örnek / Example :

$$f(x) = \begin{cases} 3-4x & ; x \leq -2 \\ x^2 & ; x > -2 \end{cases}$$

$$g(x) = 2x - 4$$

$$\Rightarrow (f \circ g)(x) = ?$$

Çözüm / Solution:

$$\begin{aligned} (f \circ g)(x) &= f(g(x)) = \begin{cases} 3-4 \cdot g(x) & ; g(x) \leq -2 \\ (g(x))^2 & ; g(x) > -2 \end{cases} \\ &= \begin{cases} 3-4 \cdot (2x-4) & ; 2x-4 \leq -2 \\ (2x-4)^2 & ; 2x-4 > -2 \end{cases} \\ &= \begin{cases} -8x+19 & ; x \leq 1 \\ 4x^2-16x+16 & ; x > 1 \end{cases} \end{aligned}$$

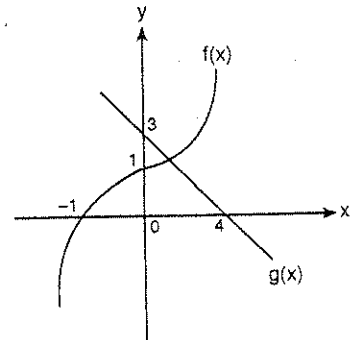
☞ (a, b) noktası f(x) in grafiği üzerinde bir nokta ise f(a) = b dir.

(If the point (a,b) is on the graph of f(x), f(a) = b)

Örnek / Example :

$$(f \circ g)(4) = ?$$

$$(g \circ f)(-1) = ?$$



Çözüm / Solution:

$$(-1, 0) \Rightarrow f(-1) = 0,$$

$$(0, 1) \Rightarrow f(0) = 1,$$

$$(4, 0) \Rightarrow g(4) = 0,$$

$$(0, 3) \Rightarrow g(0) = 3$$

$$\Rightarrow (f \circ g)(4) = f(g(4)) = f(0) = 1$$

$$\Rightarrow (g \circ f)(-1) = g(f(-1)) = g(0) = 3$$



MUTLAK DEĞER / THE ABSOLUTE VALUE

$x \in \mathbb{R}$ olmak üzere, x in mutlak değeri $|x|$ biçiminde gösterilir.

$$|x| = \begin{cases} x, & x \geq 0 \text{ ise} \\ -x, & x < 0 \text{ ise} \end{cases} \text{ şeklinde tanımlanır.}$$

If $x \in \mathbb{R}$, the absolute value of x is denoted by $|x|$ and defined as follows:

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

Örnek / Example :

$$f(x) = |x - 6| + |3 - x| + 2 + x \Rightarrow f(5) = ?$$

$$A) 6 \quad B) 7 \quad C) 8 \quad D) 9 \quad E) 10$$

Çözüm / Solution:

$$f(5) = |5 - 6| + |3 - 5| + 2 + 5 = 1 + 2 + 7 = 10$$

Yanıt / Answer E



TAM DEĞER FONKSİYONU

GREATEST INTEGER FUNCTION

Tanım: $\forall x \in \mathbb{R}$ için, x tamsayı ise kendisine, değilse kendisinden küçük en büyük tamsayıya, x in tam değeri denir ve $[x]$ biçiminde gösterilir.

$$[x] = a \quad (a \in \mathbb{Z}) \Rightarrow a \leq x < a + 1$$

Definition: Provided that $\forall x \in \mathbb{R}$, if x is an integer, it equals to its own value but if x is not an integer, the greatest integer less than is called greater function of x , and it is denoted by $[x]$.

$$[x] = a \quad (a \in \mathbb{Z}) \Rightarrow a \leq x < a + 1$$

Örnekler / Examples:

$$[-3] = -3, \quad [-3, 1] = -4$$

$$[5] = 5, \quad [6, 8] = 6$$

$$[\pi] = 3, \quad [-\pi] = -4$$

Örnek / Example :

$$[x + 2] = 3 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$[x + 2] = 3 \Rightarrow 3 \leq x + 2 < 3 + 1$$

$$\Rightarrow 1 \leq x < 2$$

$$x \in [1, 2)$$

Örnek / Example :

$$\left[\left[x + \left[x + [x] \right] \right] \right] = 6 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$[x] \in \mathbb{Z}$$

$$[x + [x + [x + [x]]]] = 6$$

$$[x] + [x] + [x] = 6$$

$$3[x] = 6 \Rightarrow [x] = 2 \Rightarrow 2 \leq x < 3$$

$$\text{ÇK(SS)} = [2, 3)$$

Örnek / Example :

$$[3x - 2] \leq 3 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$[3x - 2] \leq 3 \Rightarrow 3x - 2 < 4$$

$$\Rightarrow 3x < 6 \Rightarrow x < 2$$

$$\text{ÇK(SS)} = (-\infty, 2)$$



İŞARET FONKSİYONU / THE SIGNUM FUNCTION

Tanım : $A \subset \mathbb{R}$ olmak üzere,

$f: A \rightarrow \mathbb{R}$, $f: x \rightarrow y = f(x)$ fonksiyonu için,

$$g(x) = \text{sgn}(f(x)) = \begin{cases} -1, & f(x) < 0 \text{ ise} \\ 0, & f(x) = 0 \text{ ise} \\ 1, & f(x) > 0 \text{ ise} \end{cases}$$

şeklinde tanımlanır. Burada, $g: A \rightarrow \mathbb{R}$, fonksiyonuna f nin işaret fonksiyonu denir.

Definition: Provided that $A \subset \mathbb{R}$ and $f: A \rightarrow \mathbb{R}$, for

$f: x \rightarrow y = f(x)$, the function $g: A \rightarrow \mathbb{R}$ is defined as

$$g(x) = \text{sgn}(f(x)) = \begin{cases} -1, & f(x) < 0 \\ 0, & f(x) = 0 \\ 1, & f(x) > 0 \end{cases}$$

Here, the function $g: A \rightarrow \mathbb{R}$ is called the signum function of f .

Örnek / Example :

$$f: A \rightarrow \mathbb{R},$$

$$f: x \rightarrow y = f(x),$$

olduğuna göre,

$$g(x) = \text{sgn}(f(x))$$

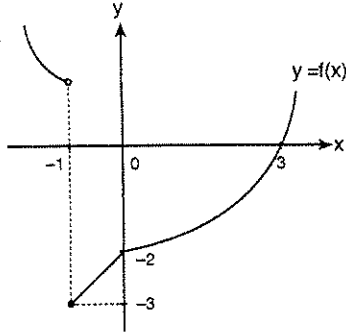
fonksiyonunun grafiğini çiziniz.

$$\text{If } f: A \rightarrow \mathbb{R},$$

$$f: x \rightarrow y = f(x),$$

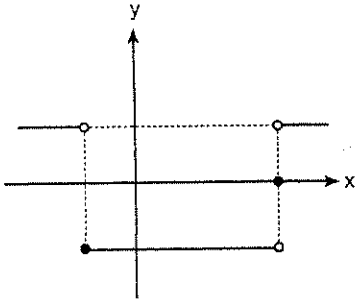
draw the graph

of $g(x) = \text{sgn}(f(x))$.



Çözüm / Solution:

$$g(x) = \begin{cases} -1, & -1 \leq x < 3 \\ 0, & x = 3 \\ 1, & x < -1 \vee x > 3 \end{cases}$$

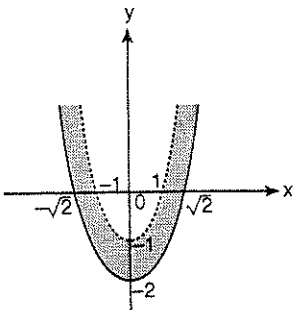


Örnek / Example :

$[|y - x^2|] = -2$ bağıntısının grafiğini çiziniz.

Draw the graph of the function $[|y - x^2|] = -2$.

Çözüm / Solution:



$$\begin{aligned} [|y - x^2|] = -2 &\Rightarrow -2 \leq y - x^2 < -1 \\ &\Rightarrow x^2 - 2 \leq y < x^2 - 1 \end{aligned}$$

Örnek / Example :

$f: [-2, 2] \rightarrow \mathbb{R}, f(x) = [|x|]$ fonksiyonunun grafiğini çiziniz.

Draw the graph of the function

$$f: [-2, 2] \rightarrow \mathbb{R}, f(x) = [|x|].$$

Çözüm / Solution:

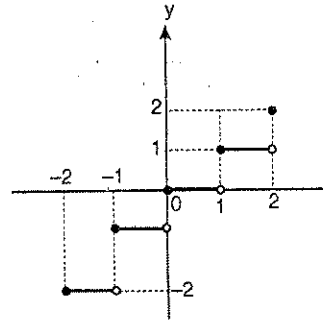
$$-2 \leq x < -1 \Rightarrow [|x|] = -2$$

$$-1 \leq x < 0 \Rightarrow [|x|] = -1$$

$$0 \leq x < 1 \Rightarrow [|x|] = 0$$

$$1 \leq x < 2 \Rightarrow [|x|] = 1$$

$$x = 2 \Rightarrow [|x|] = 2$$



Örnek / Example :

$$2[|x + [|x + [|x - 7|] - [|x + [|x - 9|] |] = 7$$

$$\Rightarrow \text{ÇK(SS)} = ?$$

$$\text{A) } [3, 4) \quad \text{B) } [4, 5) \quad \text{C) } (5, 6)$$

$$\text{D) } [2, 3) \quad \text{E) } [8, 9)$$

Çözüm / Solution:

$$2[|x + [|x + [|x - 7|] - [|x + [|x - 9|] |] = 7 \text{ ise}$$

$$2([|x|] + [|x|] + [|x|] - 7) - ([|x|] + [|x|] - 9) = 7$$

$$6[|x|] - 14 - 2[|x|] + 9 = 7$$

$$4[|x|] - 5 = 7 \Rightarrow [|x|] = 3 \Rightarrow 3 \leq x < 4$$

$$\text{Ç} = [3, 4)$$

Yanıt / Answer A

ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

1. $f(x) = x^2 - 3x + 5 \Rightarrow f(1) = ?$
 A) -1 B) 0 C) 1 D) 2 E) 3

Çözüm / Solution:

$$f(x) = x^2 - 3x + 5$$

$$f(1) = 1^2 - 3 \cdot 1 + 5 = 3$$

Yanıt / Answer E

2. $f(x) = 2x + 1 \Rightarrow f([-1, 4]) = ?$
 A) $[-1, 9]$ B) $[-1, 9)$ C) $(-1, 9]$
 D) $(-1, 9)$ E) $\{-1, 9\}$

Çözüm / Solution:

$$f(x) = 2x + 1$$

$$x = -1 \Rightarrow f(-1) = 2 \cdot (-1) + 1 = -1$$

$$x = 4 \Rightarrow f(4) = 2 \cdot 4 + 1 = 9$$

$$[-1, 9)$$

Yanıt / Answer B

3. $f: \mathbb{R} \rightarrow \mathbb{R}$,
 $f(x) = 3 - x$
 $\Rightarrow f^{-1}(x) = ?$
 A) $3 - x$ B) $3 + x$ C) $-x - 3$
 D) $\frac{4x+1}{3}$ E) $\frac{4x-1}{3}$

Çözüm / Solution:

$$f(x) = 3 - x \Rightarrow f^{-1}(x) = 3 - x$$

Yanıt / Answer A

4. $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = \frac{3x+1}{4} \Rightarrow f^{-1}(x) = ?$

- A) $4x - 3$ B) $\frac{3x-1}{4}$ C) $\frac{3x+1}{4}$
 D) $\frac{4x+1}{3}$ E) $\frac{4x-1}{3}$

Çözüm / Solution:

$$f(x) = \frac{3x+1}{4} \Rightarrow f^{-1}(x) = \frac{4x-1}{3}$$

Yanıt / Answer E

5. $f: A \rightarrow B$, $f(x) = \frac{2x-3}{5x+4} \Rightarrow f^{-1}(x) = ?$

- A) $\frac{-4x-3}{5x+2}$ B) $\frac{-4x+3}{5x-2}$ C) $\frac{4x+3}{2-5x}$
 D) $\frac{4x+3}{5x+2}$ E) $\frac{4x-3}{2+5x}$

Çözüm / Solution:

$$f(x) = \frac{2x-3}{5x+4} \Rightarrow f^{-1}(x) = \frac{-4x-3}{5x-2} = \frac{4x+3}{2-5x}$$

Yanıt / Answer C

6. $f(3x+5) = 6x-1 \Rightarrow f(x) = ?$
 A) $2x-11$ B) $2x-12$ C) $2x+2$
 D) $2x+5$ E) $2x+10$

Çözüm / Solution:

$$f(3x+5) = 6x-1$$

$$f(x) = 6 \cdot \left(\frac{x-5}{3}\right) - 1$$

$$= 2(x-5) - 1$$

$$= 2x - 11$$

Yanıt / Answer A

7. $f\left(\frac{2x-1}{3x+1}\right) = \frac{x-1}{x-2} \Rightarrow f^{-1}(2) = ?$

- A) $\frac{1}{2}$ B) $-\frac{1}{2}$ C) $\frac{1}{4}$ D) $-\frac{1}{4}$ E) -1

Çözüm / Solution:

$$f\left(\frac{2x-1}{3x+1}\right) = \frac{x-1}{x-2}$$

$$f(x) = \frac{\left(\frac{x+1}{2-3x}\right)-1}{\left(\frac{x+1}{2-3x}\right)-2} = \frac{\frac{4x-1}{2-3x}}{\frac{7x-3}{2-3x}} = \frac{4x-1}{7x-3}$$

$$f^{-1}(x) = \frac{3x-1}{7x-4} \Rightarrow f^{-1}(2) = \frac{3 \cdot 2 - 1}{7 \cdot 2 - 4} = \frac{5}{10} = \frac{1}{2}$$

Yanıt / Answer A

8. $f(2x+1) = 6x+4 \Rightarrow f(1) = ?$

- A) 3 B) 4 C) 5 D) 6 E) 10

Çözüm / Solution:

$$f(2x+1) = 6x+4$$

$$f(x) = 6 \cdot \left(\frac{x-1}{2}\right) + 4$$

$$= 3x - 3 + 4$$

$$f(x) = 3x + 1$$

$$f(1) = 3 \cdot 1 + 1 = 4$$

Yanıt / Answer B

9. $f\left(\frac{2x-4}{3x}\right) = 2x-1 \Rightarrow f(2) = ?$

- A) -1 B) -2 C) -3 D) -4 E) 5

Çözüm / Solution:

$$f\left(\frac{2x-4}{3x}\right) = 2x-1$$

$$f(x) = 2 \cdot \left(\frac{4}{2-3x}\right) - 1$$

$$f(2) = 2 \cdot \frac{4}{-4} - 1 = -3$$

Yanıt / Answer C

10. ($a > 0$),

$$f: A \rightarrow B,$$

$$f(x) = \frac{-3x}{x+a}$$

$$f(x) = f^{-1}(x)$$

$$\Rightarrow a = ?$$

- A) 1 B) 2 C) 3 D) 4 E) 6

Çözüm / Solution:

$$f(x) = \frac{-3x}{x+a} \Rightarrow f^{-1}(x) = \frac{-ax}{x+3}$$

$$\frac{-3x}{x+a} = \frac{-ax}{x+3}$$

$$3x + 9 = ax + a^2$$

$$a^2 = 9, a = 3$$

Yanıt / Answer C

11. $f: \mathbb{R} \setminus \{3\} \rightarrow \mathbb{R} \setminus \{2\}$

$$f(x) = \frac{2x+m}{x-3}, f^{-1}(4) = 1 \Rightarrow m = ?$$

- A) 4 B) 6 C) 8 D) -10 E) -8

Çözüm / Solution:

$$f(x) = \frac{2x+m}{x-3}$$

$$f^{-1}(4) = 1 \Rightarrow f(1) = 4$$

$$\frac{2 \cdot 1 + m}{1 - 3} = 4$$

$$2 + m = -8 \Rightarrow m = -10$$

Yanıt / Answer D

12. $f, g : \mathbb{R} \rightarrow \mathbb{R}$,

$$(f \circ g)(x) = 6x + 3,$$

$$g(x) = 3x - 1$$

$$\Rightarrow f(x) = ?$$

- A) $2x + 1$ B) $2x + 3$ C) $2x + 5$
D) $2x + 6$ E) $2x + 8$

Çözüm / Solution:

$$g(x) = 3x - 1$$

$$(f \circ g)(x) = f[g(x)] = 6x + 3$$

$$f(3x - 1) = 6x + 3$$

$$f(x) = 6\left(\frac{x+1}{3}\right) + 3$$

$$= 2x + 5$$

Yanıt / Answer C

13. $f, g : \mathbb{R} \rightarrow \mathbb{R}$,

$$f(x) = \frac{3x+4}{7}, \quad g(x) = \frac{7x-4}{3}$$

$$\Rightarrow (f \circ g)(x) = ?$$

- A) x B) $x + 1$ C) $x - 1$ D) $x + 2$ E) 1

Çözüm / Solution:

$$f(x) = \frac{3x+4}{7}, \quad g(x) = \frac{7x-4}{3}$$

$$(f \circ g)(x) = f[g(x)] = \frac{3 \cdot \left(\frac{7x-4}{3}\right) + 4}{7}$$

$$= \frac{21x - 12 + 12}{7} = x$$

Yanıt / Answer A

14. $f, g : \mathbb{R} \rightarrow \mathbb{R}$,

$$f(x) = x + 1,$$

$$g(x) = x^3$$

$$\Rightarrow (g \circ f^{-1})(-1) = ?$$

- A) -6 B) -8 C) -10 D) -12 E) -27

Çözüm / Solution:

$$f(x) = x + 1 \Rightarrow f(x)^{-1} = x - 1$$

$$g(x) = x^3$$

$$(g \circ f^{-1})(x) = g[f^{-1}(x)]$$

$$= (x - 1)^3$$

$$(g \circ f^{-1})(-1) = (-1 - 1)^3 = -8$$

Yanıt / Answer B

15. $f(x) = 2x + 15$ $g(x) = 8x - 1$ $\Rightarrow (g^{-1} \circ f)(0) = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

Çözüm / Solution:

$$f(x) = 2x + 15$$

$$g(x) = 8x - 1 \Rightarrow g^{-1}(x) = \frac{x+1}{8}$$

$$(g^{-1} \circ f)(x) = g^{-1}[f(x)]$$

$$= \frac{2x + 15 + 1}{8} = \frac{2x + 16}{8} = \frac{x + 8}{4}$$

$$(g^{-1} \circ f)(0) = \frac{0 + 8}{4} = 2$$

Yanıt / Answer E

16. $\frac{f(x)}{2f(x) - x} = \frac{1}{1 - x} \Rightarrow f^{-1}(x) = ?$

- A) $-\frac{1}{x+1}$ B) $\frac{1}{x+1}$ C) $\frac{x}{x-1}$
D) $-\frac{x}{x-1}$ E) $\frac{-x}{x+1}$

Çözüm / Solution:

$$\frac{f(x)}{2 \cdot f(x) - x} = \frac{1}{1-x}$$

$$(1-x) \cdot f(x) = 2 \cdot f(x) - x$$

$$f(x) - x \cdot f(x) - 2f(x) = -x$$

$$f(x) \cdot [-x-2] = -x$$

$$f(x) = \frac{x}{x+1} \Rightarrow f^{-1}(x) = \frac{x}{1-x}$$

$$= \frac{-x}{x-1}$$

Yanıt / Answer D

Çözüm / Solution:

$$4 > 3 \Rightarrow f(x) = \frac{x}{2}$$

$$f(4) = \frac{4}{2} = 2$$

$$0 < 1 \Rightarrow f(x) = 2x - 5$$

$$f(0) = 2 \cdot 0 - 5 = -5$$

$$f(4) + 2 \cdot f(0) = 2 + 2 \cdot (-5) = 2 - 10 = -8$$

Yanıt / Answer C

17. $f(x) = \frac{2x+1}{3x+2}, x \neq -\frac{2}{3}$

$$(f \circ f)(x) = \frac{ax+4}{bx+7} \Rightarrow a+b = ?$$

A) 12 B) 13 C) 15 D) 17 E) 19

Çözüm / Solution:

$$f(x) = \frac{2x+1}{3x+2} = (f \circ f)(x) = \frac{2 \cdot \left(\frac{2x+1}{3x+2}\right) + 1}{3 \cdot \left(\frac{2x+1}{3x+2}\right) + 2}$$

$$= \frac{7x+4}{12x+7} = \frac{ax+4}{bx+7}$$

$$a = 7, b = 12 \Rightarrow a + b = 7 + 12 = 19$$

Yanıt / Answer E

18. $f(x) = \begin{cases} 2x-5, & x < 1 \\ \frac{x}{2}, & x \geq 3 \end{cases} \Rightarrow f(4) + 2 \cdot f(0) = ?$

A) 3 B) 2 C) -8 D) -9 E) -10

19. $f, g, h: \mathbb{R} \rightarrow \mathbb{R}$

$$f(x) = 2x,$$

$$g(x) = 3x + 1,$$

$$h(x) = \frac{x}{3}$$

$$\Rightarrow (g \circ f \circ h)(1) = ?$$

A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution:

$$f(x) = 2x, g(x) = 3x + 1, h(x) = \frac{x}{3}$$

$$(g \circ f \circ h)(x) = g(f(h(x)))$$

$$= g\left(2 \cdot \frac{x}{3}\right) = 3 \cdot \frac{2x}{3} + 1$$

$$= 2x + 1$$

$$(g \circ f \circ h)(1) = 2 \cdot 1 + 1 = 3$$

Yanıt / Answer C

YÖS SORULARI / YÖS QUESTIONS

1. $f(x) = x - 1$, $g(x) = 2x + x^2 \Rightarrow (g \circ f)(x) = ?$

- A) $(x + 1)^2$ B) $(x - 1)^2$ C) $x^2 + 1$
D) $x^2 - 1$ E) $x^2 + 2x - 1$

(YÖS 1988)

Çözüm / Solution:

$$\left. \begin{array}{l} f(x) = x - 1 \\ g(x) = 2x + x^2 \end{array} \right\} \Rightarrow g[f(x)] = 2(x - 1) + (x - 1)^2$$

$$= 2x - 2 + x^2 - 2x + 1$$

$$= x^2 - 1$$

Yanıt / Answer D

2. $g(x) = 2x + 1$, $(g \circ f)(x) = x - 1 \Rightarrow f(4) = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

(YÖS 1988)

Çözüm / Solution:

$$(g \circ f)(x) = g[f(x)] = x - 1$$

$$g(x) = 2x + 1 \Rightarrow 2 \cdot f(x) + 1 = x - 1$$

$$f(x) = \frac{x - 2}{2}$$

$$f(4) = \frac{(4 - 2)}{2} = 1$$

Yanıt / Answer D

3. $f(x) = \begin{cases} x^2 + 2, & x < 3 \\ 2x - 1, & x \geq 3 \end{cases}$

$$\Rightarrow f(f(2)) = ?$$

- A) 9 B) 10 C) 11 D) 12 E) 13

(YÖS 1989)

Çözüm / Solution:

$$2 < 3 \Rightarrow f(x) = x^2 + 2$$

$$f(2) = 2^2 + 2 = 6$$

$$6 > 3 \Rightarrow f(x) = 2x - 1$$

$$f(6) = 2 \cdot 6 - 1 = 11$$

Yanıt / Answer C

4. $f(x) = ax - 1$, $g(x) = x^2 - 1$, $h(x) = \frac{x}{2} + 1$

$$(f \circ g \circ h)(2) = 14 \Rightarrow a = ?$$

- A) 2 B) 3 C) 4 D) 5 E) 6

(YÖS 1989)

Çözüm / Solution:

$$(f \circ g \circ h)(x) = f(g(h(x)))$$

$$= a \cdot \left[\left(\frac{x}{2} + 1 \right)^2 - 1 \right] - 1$$

$$= a \cdot \left(\frac{x^2}{4} + x \right) - 1$$

$$x = 2 \Rightarrow (f \circ g \circ h)(2) = a \cdot \left(\frac{2^2}{4} + 2 \right) - 1 = 14$$

$$3a - 1 = 14$$

$$3a = 15 \Rightarrow a = 5$$

Yanıt / Answer D

5. $f(x) = \frac{x\sqrt{2-3}}{\sqrt{3}} \Rightarrow f^{-1}(x) = ?$

- A) $\frac{x\sqrt{3}+3}{\sqrt{2}}$ B) $\frac{x\sqrt{2}-\sqrt{3}}{\sqrt{2}}$ C) $\frac{3x-x\sqrt{3}}{\sqrt{2}}$
D) $\frac{2-x\sqrt{3}}{\sqrt{2}}$ E) $\frac{3-x\sqrt{2}}{\sqrt{3}}$

(YÖS 1989)

Çözüm / Solution:

$$f(x) = \frac{x\sqrt{2-3}}{\sqrt{3}} \Rightarrow f^{-1}(x) = \frac{x\sqrt{3}+3}{\sqrt{2}}$$

Yanıt / Answer A

6. $f\left(\frac{x-1}{2}\right) = 2x - 2 \Rightarrow f(x) = ?$

- A) $4x - 4$ B) $4x + 4$ C) $4x$
D) $2x - 1$ E) $2x - 3$

(YÖS 1991)

Çözüm / Solution:

$$f\left(\frac{x-1}{2}\right) = 2x - 2 \Rightarrow f(x) = 2 \cdot (2x + 1) - 2 = 4x$$

Yanıt / Answer C

7. $f(x) = \frac{x\sqrt{3}-a}{a}$, $f^{-1}(x) = x+1 \Rightarrow a = ?$

- A) -3 B) $-\sqrt{3}$ C) 0 D) $\sqrt{3}$ E) 3

(YÖS 1990)

Çözüm / Solution:

$$f(x) = \frac{x\sqrt{3}-a}{a} \Rightarrow f^{-1}(x) = \frac{x \cdot a + a}{\sqrt{3}} = x+1$$

$$a(x+1) = \sqrt{3} \cdot (x+1)$$

$$a = \sqrt{3}$$

Yanıt / Answer D

8. $g(x) = 2x - 2$, $(g \circ f)(x) = 2x - 4 \Rightarrow f(x) = ?$

- A) $x - 1$ B) $-x - 1$ C) $x + 1$
D) $2x - 1$ E) $2x + 1$

(YÖS 1991)

Çözüm / Solution:

$$g(x) = 2x - 2$$

$$(g \circ f)(x) = g(f(x)) = 2 \cdot f(x) - 2 = 2x - 4$$

$$2 \cdot f(x) = 2x - 2, \quad f(x) = x - 1$$

Yanıt / Answer A

9. $f(x) = 2x + 1$, $g(x) = x^2 - a$
 $(f \circ g)(x) = 2x^2 - 3 \Rightarrow a = ?$

- A) -3 B) -1 C) 0 D) 1 E) 2

(YÖS 1993)

Çözüm / Solution:

$$f(x) = 2x + 1, \quad g(x) = x^2 - a$$

$$(f \circ g)(x) = f(g(x)) = 2(x^2 - a) + 1 = 2x^2 - 3$$

$$2x^2 - 2a + 1 = 2x^2 - 3$$

$$-2a + 1 = -3$$

$$2a = 4, \quad a = 2$$

Yanıt / Answer E

10. $f(x) = mx^2 + nx + r$, $g(x) = 4x + 3$

$$(g \circ f)(x) = 4x^2 + 16x + 11 \Rightarrow m \cdot n \cdot r = ?$$

- A) 2 B) 4 C) 6 D) 7 E) 8

(YÖS 1994)

Çözüm / Solution:

$$f(x) = mx^2 + nx + r$$

$$g(x) = 4x + 3$$

$$(g \circ f)(x) = g(f(x)) = 4(mx^2 + nx + r) + 3$$

$$= 4x^2 + 16x + 11$$

$$4mx^2 + 4nx + 4r + 3 = 4x^2 + 16x + 11$$

$$4m = 4 \Rightarrow m = 1$$

$$4n = 16 \Rightarrow n = 4$$

$$4r + 3 = 11 \Rightarrow r = 2$$

$$m \cdot n \cdot r = 1 \cdot 4 \cdot 2 = 8$$

Yanıt / Answer E

11. $f: \mathbb{R} \rightarrow \mathbb{R}$ $g: \mathbb{R} \rightarrow \mathbb{R}$

$$f(x) = 8x + 6 \quad g(x) = 4x - 2$$

$$\Rightarrow (f^{-1} \circ g)^{-1}(1) = ?$$

- A) 2 B) 3 C) 4 D) 5 E) 6

(YÖS 1995)

Çözüm / Solution:

$$f(x) = 8x + 6 \Rightarrow f^{-1}(x) = \frac{x-6}{8}$$

$$g(x) = 4x - 2$$

$$(f^{-1} \circ g)(x) = \frac{(4x-2)-6}{8} = \frac{4x-8}{8}$$

$$= \frac{x-2}{2}$$

$$(f^{-1} \circ g)^{-1}(x) = 2x + 2$$

$$(f^{-1} \circ g)^{-1}(1) = 2 \cdot 1 + 2 = 4$$

Yanıt / Answer C

12. $f(x) = 2x - 1$

$$(g \circ f)(x) = 2x - 3$$

$$\Rightarrow g(3) = ?$$

- A) 0 B) 1 C) 2 D) 3 E) 4

(YÖS 1997)

Çözüm / Solution:

$$(g \circ f)(x) = 2x - 3$$

$$g(f(x)) = 2x - 3$$

$$g(2x - 1) = 2x - 3$$

$$x = 2 \Rightarrow g(2 \cdot 2 - 1) = 2 \cdot 2 - 3$$

$$g(3) = 1$$

Yanıt / Answer B

$$13. f: \mathbb{R} \rightarrow \mathbb{R}$$

$$f(x) = 2x - 5$$

$$(g \circ f)(x) = 4x + 1 \Rightarrow g(x) = ?$$

$$A) 3x - 8$$

$$B) 3x + 11$$

$$C) 2x - 11$$

$$D) 2x + 8$$

$$E) 2x + 11$$

(YÖS 1998)**Çözüm / Solution:**

$$f(x) = 2x - 5$$

$$(g \circ f)(x) = g[f(x)]$$

$$\Rightarrow g(2x - 5) = 4x + 1$$

$$g(x) = 4\left(\frac{x+5}{2}\right) + 1$$

$$= 2x + 11$$

Yanıt / Answer E

$$14. f(x) = x$$

$$g(x) = 2x$$

$$h(x) = 3x$$

$$(f \circ g \circ h)(x) = k \cdot h(x) \Rightarrow k = ?$$

$$A) 1$$

$$B) 2$$

$$C) 3$$

$$D) 5$$

$$E) 6$$

(YÖS 2001)**Çözüm / Solution:**

$$(f \circ g \circ h)(x) = f(g(h(x)))$$

$$= x \circ (6x)$$

$$= 6x$$

$$\Rightarrow (f \circ g \circ h)(x) = k \cdot h(x)$$

$$6x = k \cdot 3x$$

$$k = 2$$

Yanıt / Answer B

$$15. f: \mathbb{R} \rightarrow \mathbb{R}^+$$

$$f(x) = 3^x \Rightarrow f^{-1}(81) = ?$$

$$A) 2$$

$$B) 3$$

$$C) 4$$

$$D) 5$$

$$E) 6$$

(YÖS 2002)**Çözüm / Solution:**

$$f(a) = b \Rightarrow f^{-1}(b) = a$$

Then,

$$f(4) = 3^4 = 81 \Rightarrow f^{-1}(81) = 4$$

Yanıt / Answer C

$$16. f: \mathbb{R} - \left\{\frac{1}{5}\right\} \rightarrow \mathbb{R}$$

$$f(x) = \frac{5-x}{1-5x}$$

$$(f \circ f)(x) = ?$$

$$A) \frac{x}{4}$$

$$B) \frac{3x}{4}$$

$$C) x - 2$$

$$D) x - 1$$

$$E) x$$

(YÖS 2002)**Çözüm / Solution:**

$$(f \circ f)(x) = \frac{5 - \left(\frac{5-x}{1-5x}\right)}{1 - 5 \cdot \left(\frac{5-x}{1-5x}\right)} = x$$

Yanıt / Answer E

$$17. f: \mathbb{R} \rightarrow \mathbb{R}$$

$$f(x) = \begin{cases} x+1, & x < -2 \\ x^2+4x, & -2 \leq x < 3 \\ 2x+3, & 3 \leq x \end{cases}$$

$$f(-4) + f(2) + f(5) = ?$$

$$A) 24$$

$$B) 22$$

$$C) 20$$

$$D) 18$$

$$E) 16$$

(YÖS 2002)**Çözüm / Solution:**

$$f(-4) = -4 + 1 = -3$$

$$f(2) = 2^2 + 4 \cdot 2 = 12$$

$$f(5) = 2 \cdot 5 + 3 = 13$$

$$\Rightarrow f(-4) + f(2) + f(5) = -3 + 12 + 13 = 22$$

Yanıt / Answer B

$$18. f(x) = e^{x+2}$$

$$f(2x+2) = ?$$

$$A) [f(x)]^2$$

$$B) [f(x)]^2 + 2$$

$$C) \frac{[f(x)]^2}{2}$$

$$D) 2 \cdot f(x)$$

$$E) f(x) + 2$$

(YÖS 2003)

Çözüm / Solution:

$$\begin{aligned}f(x) = e^{x+2} &\Rightarrow f(2x+2) = e^{2x+2+2} \\&\Rightarrow f(2x+2) = e^{2(x+2)} \\&\Rightarrow f(2x+2) = [e^{x+2}]^2 \\&\Rightarrow f(2x+2) = [f(x)]^2\end{aligned}$$

Yanıt / Answer A

$$\begin{aligned}19. \quad &\left. \begin{aligned}f(x) &= ax \\g(x) &= x+b \\(fog)(x) &= x+2\end{aligned} \right\} \Rightarrow b-a = ?\end{aligned}$$

- A) 2 B) 1 C) 0 D) -1 E) -2
(YÖS 2004)

Çözüm / Solution:

$$\begin{aligned}fog(x) &= x+2 \\a \cdot (x+b) &= x+2 \\ax+ab &= x+2 \\ax &= x \text{ ve (and) } ab=2 \\a &= 1 \Rightarrow b=2 \\b-a &= 2-1=1\end{aligned}$$

Yanıt / Answer B

$$\begin{aligned}20. \quad &f(x) = x-3 \\&fog(x) = x^2 - 6x + 6 \\&g(x) = ? \\&A) x^2 - 3 \quad B) x^2 - 6 \quad C) (x-1)^2 \\&D) (x-2)^2 \quad E) (x-3)^2\end{aligned}$$

(YÖS 2005)

Çözüm / Solution:

$$\begin{aligned}(fog)(x) &= x^2 - 6x + 6 \\g(x) - 3 &= x^2 - 6x + 6 \\g(x) &= x^2 - 6x + 9 \\g(x) &= (x-3)^2\end{aligned}$$

Yanıt / Answer E

$$\begin{aligned}21. \quad &f: R \rightarrow R \\&f(x+1) = 3x+7 \\&f^{-1}(a) = 2 \Rightarrow a = ? \\&A) 4 \quad B) 6 \quad C) 8 \quad D) 10 \quad E) 12\end{aligned}$$

(YÖS 2006)

Çözüm / Solution:

$$\begin{aligned}f^{-1}(a) = 2 &\Rightarrow f(2) = a \\f(x+1) = 3x+7 &\Rightarrow f(2) = 3 \cdot 1 + 7 = 10 \\&\Rightarrow a = 10\end{aligned}$$

Yanıt - Answer D

$$22. \quad (fog)(x) = f(g(x))$$

$$f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & 4 \end{pmatrix}$$

$$g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 1 \end{pmatrix}$$

$$\Rightarrow fog = ?$$

$$A) \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 4 & 2 & 3 \end{pmatrix}$$

$$B) \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 1 & 4 \end{pmatrix}$$

$$C) \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 4 & 3 & 2 \end{pmatrix}$$

$$D) \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 1 & 4 \end{pmatrix}$$

$$E) \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$$

(YÖS 2007)

Çözüm / Solution:

$$\begin{aligned}(fog)(x) &= f(g(x)) \\&\Rightarrow f(g(1)) = f(4) = 4 \\&f(g(2)) = f(3) = 3 \\&f(g(3)) = f(2) = 1 \\&f(g(4)) = f(1) = 2 \\&\Rightarrow fog = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}\end{aligned}$$

Yanıt / Answer E

$$23. \quad f(x) = 2^{3x}$$

$$f(x+4) = k \cdot f(x)$$

$$\Rightarrow k = ?$$

- A) 2^{12} B) 2^{10} C) 2^9 D) 2^7 E) 2^6

(YÖS 2007)

Çözüm / Solution:

$$\begin{aligned}f(x) &= 2^{3x} \\f(x+4) &= 2^{3(x+4)} \\&= 2^{3x} \cdot 2^{12} \\&= f(x) \cdot 2^{12} \\&\Rightarrow k = 2^{12}\end{aligned}$$

Yanıt / Answer A

1. $f: \mathbb{N}^+ \rightarrow \mathbb{R}$,

$$f(n) = \frac{1}{n} \cdot f(n+1), f(1) = 1 \Rightarrow f(17) = ?$$

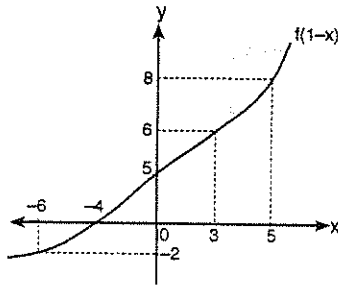
Yanıt / Answer : 16!

2. $A \subset \mathbb{R}, B \subset \mathbb{R}, f: A \rightarrow B$,

$$f(x) = \frac{-2x}{x+a}, (f \circ f)(x) = x \Rightarrow a = ?$$

Yanıt / Answer : 2

3. $\frac{f(7) - f(-4)}{f^{-1}(5) + f^{-1}(0)} = ?$

Yanıt / Answer : $-\frac{5}{3}$

4. $g(x) = x+1, f(x) = \frac{x+1}{x-1} \Rightarrow (f \circ g)^{-1}(x) = ?$

Yanıt / Answer : $\frac{2}{x-1}$

5. $f(3x+1) = 9x^2 - 3x \Rightarrow f(x^2) = ?$

Yanıt / Answer : $x^4 - 3x^2 + 2$

6. $f\left(\frac{x+1}{3}\right) = \frac{x}{2} + 1 \Rightarrow f(2) = ?$

Yanıt / Answer : $\frac{7}{2}$

7. $f(x) = ax - 5$,

$g(x) = 2x + a$

$(g \circ f)(-3) = 15$

$\Rightarrow a = ?$

Yanıt / Answer : -5

8. $f(-x) = 2 \cdot f(x) + 6 \Rightarrow f(3) = ?$

Yanıt / Answer : -6

9. $f: \mathbb{R} \rightarrow \mathbb{R}$,
 $f(2x + 1) = 2ax + 2$,
 $f^{-1}(4) = 3 \Rightarrow a = ?$

Yanıt / Answer : 1

10. $f(x) = \frac{3}{x-1} \Rightarrow f(x+1) = ?$

Yanıt / Answer : $\frac{3f(x)}{3+f(x)}$

11. $f(x) = ax + 3$, $f^{-1}(2) = 3 \Rightarrow f^{-1}(5) = ?$

Yanıt / Answer : -6

12. $f(x) = \frac{x}{4} + 2$, $g(x) = \frac{2}{x} - 1$,
 $(f^{-1} \circ g)(x) = 3x - 14 \Rightarrow x = ?$

Yanıt / Answer : 2

13. $f: (-3, \infty) \rightarrow \mathbb{R}$
 $g(x) = x^2 + 4x + 1$,
 $(g \circ f)(x) = x^2 - 6x + 6 \Rightarrow f(x) = ?$

Yanıt / Answer : $x - 5$

14. $f(x) = x^2 - 1$ ve (and)
 $g(3x - 1) = 12x - 1$
 $\Rightarrow (g^{-1} \circ f)(4) = ?$

Yanıt / Answer : 3

15. $f: \mathbb{R} \rightarrow \mathbb{R}$, $g: \mathbb{R} - \{-1\} \rightarrow \mathbb{R} - \{1\}$,
 $f^{-1}(3x - 2) = 6x + 5$,
 $g(x) = \frac{x-1}{x+1}$, $(f^{-1} \circ g)(a) = \frac{51}{5} \Rightarrow a = ?$

Yanıt / Answer : 4

16. $f: \mathbb{R} \rightarrow \mathbb{R}$, $f: x \rightarrow y = f(x)$
 $f(x-3) = \frac{ax}{3x+1}$, $f(x) = f^{-1}(x) \Rightarrow f(2) = ?$

Yanıt / Answer : $-\frac{25}{8}$

1. $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = \frac{3x+4}{2} \Rightarrow f\left(\frac{2}{3}\right) = ?$

- A) -3 B) -1 C) 0 D) 2 E) 3

$$\frac{2+4}{2} = 3$$

2. $f: \mathbb{R} \rightarrow \mathbb{R}, f(x+1) = 3x-7 \Rightarrow f(x) = ?$

- A) $3x+10$ B) $3x+2$ C) $3x-2$
D) $3x-4$ E) $3x-10$

$$x-1 = 3x-3-7$$

3. $f: \mathbb{R} \setminus \{0\} \rightarrow \mathbb{R} \setminus \{3\}$

$$f(x) = \frac{3x-5}{x+0} \Rightarrow f^{-1}(x) = ?$$

- A) $\frac{3x+5}{x}$ B) $\frac{5}{x+3}$ C) $\frac{5}{x-3}$
D) $\frac{-5}{x-3}$ E) $\frac{-5}{x+3}$

$$\frac{x-5}{x-3}$$

$$2(2x+3)+3$$

4. $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = 2x+3 \Rightarrow (f \circ f)(x) = ?$

- A) $4x+9$ B) $4x+6$ C) $4x+3$
D) $4x+1$ E) $4x$

$$12x-40 = 3x-10$$

5. $f, g: \mathbb{R} \rightarrow \mathbb{R}, (f \circ g)(x) = 12x-1, f(x) = 4x+3 \Rightarrow g(x) = ?$

- A) $3x+1$ B) $3x-1$ C) $3x-2$
D) $3x-3$ E) $3x-4$

6. $f, g: \mathbb{R} \rightarrow \mathbb{R} \Rightarrow f(x) = 2x+1, \Rightarrow (f \circ g)(x) = 3 \cdot f(x)/g(3) = ?$

- A) 6 B) 7 C) 8 D) 9 E) 10

7. $f, g: \mathbb{R} \rightarrow \mathbb{R}, f(x-1) = x+4, g(x) = 3x+4 \Rightarrow (f^{-1} \circ g)(3) = ?$

- A) 8 B) 9 C) 12 D) 16 E) 18

8. $f(3^x) = 5 \cdot x \Rightarrow f(27) = ?$

- A) 12 B) 15 C) 18 D) 21 E) 24

9. $f: \mathbb{R} \rightarrow \mathbb{R}, f^{-1}(x) = \frac{5x+4}{x+7} \Rightarrow f\left(\frac{19}{7}\right) = ?$

- A) 4 B) 3 C) 2 D) 1 E) 0

10. $f: A \rightarrow B, f(x) = \sqrt[3]{x+1} \Rightarrow f^{-1}(3) = ?$

- A) 2 B) 4 C) 18 D) 26 E) 32

11. $f, g: \mathbb{R} \rightarrow \mathbb{R}$

$$f(x) = 2x + 1, g(x) = \frac{x}{3} + 2, (f \circ g)^{-1}(x) = g(x)$$

$$\Rightarrow h(3) = ?$$

- A) 6 B) 4 C) 3 D) 2 E) 1

12. $f(x) = 3x + 1, g(x) = x^2 + x - 1$

$$\Rightarrow (f \circ g)(2) = ?$$

- A) 55 B) 38 C) 16 D) 15 E) 14

13. $f(x) = x - 2, g(x) = x^2 - 4$

$$\Rightarrow (f \circ g)^{-1}(x) = ?$$

- A) x^2 B) $x^2 + 4$ C) $x^2 - 4x$
D) $x^2 + 4x$ E) $(x + 2)^2$

14. $f(x): \mathbb{R} \rightarrow \mathbb{R}$

$$f(x) = \frac{2x \cdot f(x-1)}{x+1}, f(1) = 1$$

$$\Rightarrow f(7) = ?$$

- A) $\frac{33}{4}$ B) 32 C) 16 D) 40 E) $\frac{48}{7}$

15. $x \cdot f(x+1) = 2x^2 + x + a - 1, f(2) = -3$

$$\Rightarrow f(3) = ?$$

- A) 2 B) 3 C) 5 D) 6 E) 9

16. $f(x): \mathbb{R} \rightarrow \mathbb{R}, g: \mathbb{R} \rightarrow \mathbb{R}$

$$(f \circ g^{-1})(x) = \frac{3x+1}{2}, g(x) = 2x + 1$$

$$\Rightarrow f^{-1}(x) = ?$$

- A) $\frac{x+2}{3}$ B) $\frac{x-2}{3}$ C) $\frac{2x+1}{2}$
D) $\frac{2x-1}{3}$ E) $\frac{3x+2}{2}$

17. $f(x) = x^2 + x - 1 \Rightarrow f(x-1) = ?$

- A) $x^2 - x - 1$ B) $x^2 - 1$ C) $x^2 + x - 1$
D) $x^2 - x + 1$ E) $x^2 - 3x - 1$

18. $f(x) = 1 - |3x| + x^2$

$$\Rightarrow f(-1) + f(1) = ?$$

- A) -2 B) -1 C) 0 D) 1 E) 2

19. $f(2x+3) = x^3 - 3x - 2$

$$\Rightarrow f(-1) = ?$$

- A) -4 B) -2 C) 0 D) 4 E) 8

20. $f(2x-1) = 6x-2, g^{-1}(x) = x-2$

$$\Rightarrow (f \circ g)(x) = ?$$

- A) $3x + 1$ B) $3x + 5$ C) $3x + 7$
D) $6x - 1$ E) $6x + 2$

Yanıtlar / Answers					
1. E	2. E	3. D	4. A	5. B	6. E
7. A	8. B	9. B	10. D	11. E	12. C
13. D	14. C	15. A	16. B	17. A	18. A
19. A	20. C				

1. $f(x) = 3x - 2, g(x) = x^2 \Rightarrow (f \circ g)(2) = ?$

- A) 9 B) 10 C) 12 D) 13 E) 14

2. $f(x) = \frac{4x-14}{3x+1} \Rightarrow f^{-1}(2) = ?$

- A) -8 B) -6 C) 0 D) 6 E) 8

$$\frac{2x-14}{3x+1} = 2 \Rightarrow \frac{2x-14}{3x+1} = 2 \Rightarrow 2x-14 = 2(3x+1) \Rightarrow 2x-14 = 6x+2 \Rightarrow -4x = 16 \Rightarrow x = -4$$

3. $f(x) = 6x - 1, g(x) = 2x + 3$

$(f \circ g)(x) = 41 \Rightarrow x = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

$$12x + 18 - 1 = 41$$

$$12x + 17 = 41$$

$$12x = 24$$

4. $f(x) = -2x + 1, g^{-1}(x) = \frac{x+3}{x-2} \Rightarrow (g \circ f^{-1})(4) = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

$$\frac{-x-1}{x-2} = 4 \Rightarrow -x-1 = 4(x-2) \Rightarrow -x-1 = 4x-8 \Rightarrow -5x = -7 \Rightarrow x = \frac{7}{5}$$

5. $f(x) = 4x + 3, (g \circ f)(x) = x^2 + 1$

$\Rightarrow g(15) = ?$

- A) -10 B) -9 C) -8 D) 8 E) 10

6. $f(x) = 2x + 3, g(x) = \frac{x-1}{6x-2} \Rightarrow (f \circ g)^{-1}(1) = ?$

- A) $\frac{1}{6}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) $\frac{2}{3}$ E) $\frac{5}{6}$

7. $f(0) = 1, f(1) = 4;$

$f(n+2) = f(n) - 2 \cdot f(n+1) \Rightarrow f(3) = ?$

- A) -36 B) -24 C) -18 D) 18 E) 24

8. $f(x) = 5x + 1 \Rightarrow (f \circ f)(x) = ?$

- A) $25x^2 + 6$ B) $25x + 3$ C) $25x + 25$
D) $25x^2 + 3$ E) $25x + 6$

9. $f: A \rightarrow B$

$f: x \rightarrow 2x - 2$

$B = \{8, 10, 16, 22, 30\} \Rightarrow A = ?$

- A) $\{8, 10, 12, 16\}$ B) $\{5, 6, 9, 12, 16\}$
C) $\{5, 7, 9, 12, 16\}$ D) $\{0, 5, 10, 12, 16\}$
E) $\{5, 8, 12, 14, 16\}$

10. $f(x) = 2x - 3, (g \circ f)(x) = 6x + 5$

$\Rightarrow g(x) = ?$

- A) $3x - 4$ B) $2x + 3$ C) $3x + 14$
D) $3x - 14$ E) $3x + 4$

11. $f(x) = 3x - 4$, $(g \circ f^{-1})(x) = x + 2$

$\Rightarrow g(5) = ?$

- A) -13 B) -12 C) 12 D) 13 E) 14

12. $f(x) = \begin{cases} |x|, & -2 \leq x < 2 \\ 3x, & 2 \leq x < 4 \\ x^2 - 1, & 4 \leq x \end{cases}$

$\Rightarrow \frac{f(-2) + f(4) + 1}{f(2)} = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

13. $f(x) = f(x-1) + x$, $f(0) = 7$

$\Rightarrow f(20) = ?$

- A) 212 B) 215 C) 216
D) 217 E) 220

$f(x) = \frac{3x+b}{x+4}$, $f^{-1}(5) = 6$

14.

$\Rightarrow b = ?$

- A) 12 B) 18 C) 24 D) 26 E) 32

15. $f(x) = x - 2$, $(f \circ g)(x) = x^2 + x + 1 \Rightarrow g(x) = ?$

- A) $x^2 - 3x + 7$ B) $2x^2 + 2x - 7$
C) $x^2 + x + 3$ D) $x^2 + x - 1$
E) $x^2 - 2x + 1$

16. $x^2y + yx - y - 3 = 0 \Rightarrow y = f(x) = ?$

- A) $\frac{3}{x^2+x-1}$ B) $\frac{-3}{x^2+x-1}$ C) x^2+x+1
D) $-x^2+x-$ E) 1

17. $\frac{1}{x} + \frac{1}{y} = 1 \Rightarrow y = f(x) = ?$

- A) $\frac{x}{x-1}$ B) $\frac{-x}{x+1}$ C) $\frac{x+1}{x-1}$
D) $\frac{x-1}{x}$ E) $\frac{x-1}{x+1}$

18. $f(x) = 2x - 1$, $(g \circ f)(x) = -3 \cdot f(x) \Rightarrow g(x) = ?$

- A) $-6x + 3$ B) $-2x + 1$ C) $-3x$
D) $-2x$ E) x

19. $f(x) = 2x^2 - x + a$, $f(0) + f(1) = 13 \Rightarrow a = ?$

- A) 3 B) 4 C) 5 D) 6 E) 7

20. $f(2x+1) = 2x-1 \Rightarrow f(-2) = ?$

- A) -5 B) -4 C) -3 D) -2 E) -1

Yanıtlar / Answers

1. B	2. A	3. B	4. C	5. E	6. A
7. D	8. E	9. B	10. C	11. D	12. D
13. D	14. E	15. C	16. A	17. A	18. C
19. D	20. B				

1. $f\left(\frac{x+3}{2x}\right) = \frac{2x-1}{1-x} \Rightarrow f(x) = ?$
 A) $\frac{-2x-5}{2x+2}$ B) x C) $-x$
 D) $\frac{x-1}{x}$ E) $\frac{-2x+7}{2x-4}$
2. $f(2x-3) = 3x+5 \Rightarrow f^{-1}(x) = ?$
 A) $\frac{2x-19}{3}$ B) $\frac{2x+19}{3}$ C) $\frac{3x+19}{2}$
 D) $\frac{x+19}{3}$ E) $\frac{3x-7}{4}$
3. $f(x) = \frac{x-2}{3}$, $(f \circ g)(x) = x-1 \Rightarrow g(x) = ?$
 A) $\frac{3x-3}{2}$ B) $3x-4$ C) $3x-3$
 D) $3x-1$ E) $\frac{3x-19}{2}$
4. $f\left(\frac{2x-1}{x+3}\right) = 2x+1 \Rightarrow f(4) = ?$
 A) 18 B) 20 C) -12 D) -11 E) 0
5. $f(x+3) = 5x+7$, $g(x) = x^2-3 \Rightarrow (f \circ g)(2) = ?$
 A) -4 B) -3 C) -17 D) -12 E) -10
6. $f(x) = x+2$
 $f^{-1}(A) = \{1,2,3\} \Rightarrow A = ?$
 A) $\{0, 1, 2\}$ B) $\{-1, 0, 1\}$ C) $\{3, 4, 5\}$
 D) $\{-3, -4, -5\}$ E) $\{-1, -2, -3\}$
7. $f(x) = 3x^2+4$, $g(x) = 3x-2$
 $[f^{-1} \circ g]^{-1}(x) = x^2+a \Rightarrow a = ?$
 A) 2 B) 3 C) 4 D) 5 E) 6
8. $f(1) = 5$, $f(x+1) = f(x) + 4 \Rightarrow f(5) = ?$
 A) 15 B) 16 C) 18 D) 21 E) 24
9. $f(3x+1) = 5x-3 \Rightarrow f^{-1}(2) = ?$
 A) 1 B) 2 C) 3 D) 4 E) 5
10. $f(x) = ax+b$, $g(x) = 3x-2$, $(f \circ g)(x) = 6x+1$
 $\Rightarrow a \cdot b = ?$
 A) 2 B) 5 C) 10 D) 15 E) 20

11. $f(3x+1) = 9x^2 - 4 \Rightarrow f(2x) = ?$

- A) $36x^2 - 4$ B) $5x^2 - 4x + 1$
 C) $4x^2 - 3$ D) $4x^2 - 4x - 3$
 E) $x^2 - 2x - 3$

12. $f(2x+3) = 5x+2, g(x) = x-3$

$\Rightarrow (f^{-1} \circ g)(x) = ?$

- A) $\frac{2x+5}{5}$ B) $\frac{2x-5}{5}$ C) $\frac{2x-3}{4}$
 D) $\frac{2x-3}{3}$ E) $2x$

13. $f(x) = \frac{x+a}{2x+1}, (f \circ f)(x) = \frac{3x+2}{4x+3} \Rightarrow a = ?$

- A) -1 B) 0 C) 1 D) 2 E) 3

14. $(f \circ g^{-1})(x) = \frac{2x+1}{3}, f(x) = 4x-3 \Rightarrow g(1) = ?$

- A) -1 B) 0 C) 1 D) 2 E) 3

15. $(g \circ f^{-1})(x) = 3x, f(x) = 2x+4 \Rightarrow g(6) = ?$

- A) 5 B) 6 C) 7 D) 8 E) 48

16. $f(x) = \frac{ax+3}{bx-2}, g^{-1}(x) = x-2$

$(f^{-1} \circ g)(x) = \frac{2x+7}{3x-7} \Rightarrow a \cdot b = ?$

- A) 12 B) 27 C) 39 D) 42 E) 45

17. $f(x) = 3x+1, g(x) = \frac{3x}{2}, h(x) = \frac{x-1}{4}$

$\Rightarrow (g \circ f \circ h)(2) = ?$

- A) $\frac{11}{8}$ B) $\frac{21}{8}$ C) $\frac{11}{3}$ D) $\frac{21}{3}$ E) 7

18. $f(a, b) = (2a+1, 4b-3) \Rightarrow f(2, 3) = ?$

- A) (3,9) B) (5,9) C) (7,9) D) (3,7) E) (4,9)

19. $f(2x-1) = 4x+3 \Rightarrow f^{-1}(x) = ?$

- A) $\frac{x+5}{2}$ B) $\frac{2x-5}{2}$ C) $\frac{x-5}{2}$
 D) $\frac{x+5}{3}$ E) $\frac{2x+5}{3}$

20. $f\left(\frac{2x-1}{x+3}\right) = 4x+7 \Rightarrow f(1) = ?$

- A) 15 B) 16 C) 17 D) 18 E) 23

Yanıtlar / Answers

1. E	2. A	3. D	4. C	5. B	6. C
7. A	8. D	9. D	10. C	11. D	12. A
13. C	14. C	15. E	16. C	17. B	18. B
19. C	20. E				

1. $f\left(\frac{x+1}{x-2}\right) = 4x-1 \Rightarrow f(x) = ?$

- A) $\frac{7x+5}{x-1}$ B) $\frac{8x-5}{x-2}$ C) $\frac{5x+3}{x-1}$
D) $\frac{x-1}{7x+5}$ E) $\frac{1}{x}$

2. $f(x) = \frac{2x-7}{3x-6} \Rightarrow f^{-1}(x) = ?$

- A) $\frac{-2x+7}{3x+6}$ B) $\frac{3x-6}{2x-7}$ C) $\frac{6x-7}{3x-2}$
D) $\frac{x-7}{3x-2}$ E) $\frac{3x-7}{2x-6}$

3. $f(x) = \frac{3x-7}{x-2a}$
 $f(x) = f^{-1}(x) \Rightarrow a = ?$

- A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) 1 D) $\frac{3}{2}$ E) $\frac{5}{2}$

4. $f(x) = \frac{12x^2 - 6x + b}{ax^2 + 18x - 9}$ fonksiyonu sabit fonksiyon ise
 $f(7)$ aşağıdakilerden hangisidir?

If $f(x)$ is a constant function, what is $f(7)$?

- A) 2 B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $-\frac{2}{3}$ E) $-\frac{1}{3}$

5. $f(x) = x-3$, $(g \circ f)(x) = \frac{x+2}{x-2} \Rightarrow g(x) = ?$

- A) $\frac{x+3}{x}$ B) $\frac{x+5}{x+1}$ C) $\frac{x+2}{x+5}$
D) $\frac{x+1}{x+5}$ E) $\frac{x-1}{x+3}$

6. $f(5x-1) = \frac{4x+41}{x^2+4} \Rightarrow f(4) = ?$

- A) 5 B) 6 C) 7 D) 8 E) 9

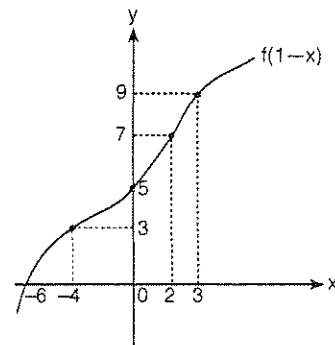
7. $f(x) = \frac{x}{x+1} \Rightarrow f(x-1) = ?$

- A) $\frac{f(x)+1}{2f(x)}$ B) $\frac{f(x)+2}{2f(x)}$ C) $\frac{2f(x)+1}{2f(x)}$
D) $\frac{2f(x)+1}{f(x)}$ E) $\frac{2f(x)-1}{f(x)}$

8. $f(x) = 4x^2 + 8x + 4 \Rightarrow f\left(\frac{x-2}{2}\right) = ?$

- A) x^2 B) $x^2 + 4$ C) $x^2 + 4x + 8$
D) $x^2 - 6x + 4$ E) $x^2 - 8$

9.



$\frac{f^{-1}(7) + f^{-1}(9)}{f(5) + f(-2)} = ?$

- A) $-\frac{3}{4}$ B) $-\frac{1}{4}$ C) $\frac{2}{3}$ D) $\frac{2}{3}$ E) $\frac{3}{4}$

10. $f(2x-3) = \frac{1}{x} + 1 \Rightarrow f(x) = ?$

- A) $\frac{x+5}{x+3}$ B) $\frac{x-5}{x+3}$ C) $\frac{x+5}{x-3}$
D) $\frac{x-5}{x-3}$ E) $\frac{x+5}{x}$

11. $f(x) = \frac{x-2}{x+a}$
 $g(x) = \frac{2x+1}{x-1}$
 $(f^{-1} \circ g)(4) = 9$
 $\Rightarrow a = ?$

- A) $\frac{16}{3}$ B) $\frac{9}{2}$ C) 1 D) $-\frac{16}{3}$ E) $-\frac{20}{3}$

12. $f(x) = \frac{2x+a}{x+3}$
 $f^{-1}(3) = 12$
 $\Rightarrow a = ?$

- A) -21 B) -14 C) 9 D) 18 E) 21

13. $f(2x-1) = 6x-9 \Rightarrow f(x) = ?$

- A) $2x-3$ B) $3x-6$ C) $3x+6$
D) $6x-3$ E) $6x+9$

14. $f: \mathbb{R} \rightarrow \mathbb{R}, f(3x+4) = 2x^2 - |1-x^2| + 3$
 $\Rightarrow f(-8) = ?$

- A) 20 B) 50 C) 63 D) 68 E) 194

15. $f: \mathbb{R} - \{3\} \rightarrow \mathbb{R} - \{4\}$

$f(x) = \frac{(a-2)x-5}{2x-(b+1)} \Rightarrow f^{-1}(x) = ?$

- A) $\frac{3x-5}{2x-6}$ B) $\frac{6x-5}{2x-8}$ C) $\frac{4x-5}{2x-3}$
D) $\frac{8x-5}{2x-3}$ E) $\frac{6x-5}{2x-10}$

26. $f(x) = x+2, (f \circ g)(x) = \frac{x+1}{x-2} \Rightarrow g(x) = ?$

- A) $\frac{x-1}{x-2}$ B) $\frac{-x+1}{x-2}$ C) $\frac{-x+3}{x-2}$
D) $\frac{-x+5}{x-2}$ E) $\frac{x+5}{x-2}$

17. $f(2x-1) = \frac{x^2-1}{3} \Rightarrow f(x) = ?$

- A) $\frac{x^2+x-2}{4}$ B) $\frac{x^2+2x-3}{6}$ C) $\frac{x^2+2x-3}{12}$
D) $\frac{x^2-x+3}{6}$ E) $\frac{x^2-2x+1}{4}$

Yanıtlar / Answers

1. A	2. C	3. D	4. E	5. B	6. E
7. E	8. A	9. B	10. A	11. E	12. E
13. B	14. A	15. B	16. D	17. C	

1. $f\left(\frac{4x+1}{x}\right) = x^2 + 2x + 3 \Rightarrow f(3) = ?$

- A) 2 B) 3 C) 4 D) 5 E) 6

2. $f\left(\frac{x-4}{2}\right) = 4x - 6 \Rightarrow f^{-1}(8x + 3) = ?$

- A) $\frac{7x-8}{7}$ B) $\frac{8x-7}{8}$ C) $\frac{8x-8}{7}$
D) $\frac{7x-7}{8}$ E) $7x - \frac{1}{8}$

3. $f(x^2 + x) = 5x^2 + 5x - 11 \Rightarrow f^{-1}(4) = ?$

- A) -3 B) -2 C) 2 D) 3 E) 4

4. $R \rightarrow R,$

$2 \cdot f(x-2) + 3 \cdot f(2+x) = x+5 \Rightarrow f(1) = ?$

- A) -3 B) $-\frac{7}{5}$ C) -1 D) $\frac{2}{5}$ E) $\frac{28}{25}$

5. $f(x) = 3x - 2$ ve (and) $g(x) = \frac{x-2}{3} \Rightarrow (g \circ f)^{-1}(x) = ?$

- A) $x + \frac{4}{3}$ B) $x - \frac{4}{3}$ C) $x + \frac{5}{3}$ D) $x - \frac{5}{3}$ E) $x - 1$

6. $f\left(\frac{2x^2-2}{x-1}\right) = \frac{x-2}{x+3} \Rightarrow f^{-1}(2) = ?$

- A) -15 B) -14 C) -13 D) -12 E) -11

7. $f(x) = \begin{cases} -2x+1, & x > 0 \\ x^2-1, & x \leq 0 \end{cases}$

$\Rightarrow (f \circ f \circ f)(-2) = ?$

- A) 22 B) 23 C) 24 D) 25 E) 26

8. $f(2x-1) = 4x+2$

$g(2-x) = 3x+2$

$\Rightarrow (g^{-1} \circ f)(5) = ?$

- A) -5 B) -4 C) -3 D) -2 E) 1

9. $f(x) = \frac{5x-2}{a}$ ve (and) $f^{-1}(x) = \frac{x+b}{5} \Rightarrow a \cdot b = ?$

- A) -3 B) -2 C) -1 D) 1 E) 2

10. $f(x) = 2 \cdot f\left(\frac{1}{x}\right) + 3x - 1 \Rightarrow f(3) = ?$

- A) $-\frac{14}{3}$ B) -4 C) $-\frac{10}{3}$ D) $-\frac{8}{3}$ E) -2

11. $f(4x) + f(2x + 2) = x + 5 \Rightarrow f(2) + f(3) + f(4) = ?$

- A) 8 B) $\frac{17}{2}$ C) 9 D) $\frac{19}{2}$ E) 10

12. $f(x) = x^4 - 8x^3 + 24x^2 - 32x + 20 \Rightarrow f(x+2) = ?$

- A) $x^4 + 4$ B) $x^4 + 20$ C) $x^4 - 4$
D) $x^2 + 4$ E) $x^2 - 4$

13. $x = \frac{2f(x)+1}{1-f(x)} \Rightarrow f^{-1}(x) = ?$

- A) $\frac{2x}{1+x}$ B) $\frac{2x-1}{1-x}$ C) $\frac{2x+1}{1-x}$ D) $\frac{2x}{1-x}$ E) $\frac{1-2x}{x+1}$

14. $f(x) = \frac{2x}{x-1} \Rightarrow f(x+1) = ?$

- A) $\frac{f(x)}{4}$ B) $\frac{f(x)-4}{4f(x)}$ C) $\frac{f(x)+4}{f(x)}$
D) $\frac{4f(x)-4}{f(x)}$ E) $\frac{f(x)-4}{f(x)}$

15. $f(x) = 6 \cdot f(x-2)$

$f(7) = 12$

$\Rightarrow f(3) = ?$

- A) $\frac{1}{15}$ B) $\frac{1}{12}$ C) $\frac{1}{9}$ D) $\frac{1}{6}$ E) $\frac{1}{3}$

16. $f(4) = -15$

$f(x-1) = f(x) + 5$

$\Rightarrow f(30) = ?$

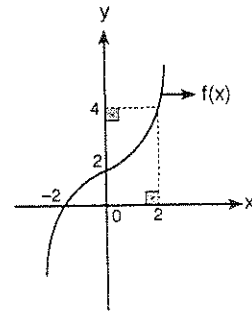
- A) -145 B) -115 C) -75 D) -60 E) -45

17. $f(x) = x^2 - x + 1$

$\Rightarrow f(1-x) - f(x) = ?$

- A) 0 B) 1 C) $1-x$ D) x^2-1 E) x^2+1

18.



$\frac{f^{-1}(0) + f(-2)}{(f \circ f)(0)} = ?$

- A) -2 B) -1 C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) 2

19. $f(x) = |x-2| - |x|$

$\Rightarrow f(-1) + f(0) + f(1) = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

Yanıtlar / Answers

1. A	2. B	3. D	4. E	5. A	6. B
7. C	8. D	9. E	10. D	11. B	12. A
13. C	14. D	15. E	16. A	17. A	18. C
19. E					

1. $f(2x+1) = 4x - 3$, $2 \cdot f(x) - f(x+1) = 5 \Rightarrow x = ?$

- A) $\frac{3}{5}$ B) 1 C) 3 D) 5 E) 6

2. $f^{-1}\left(\frac{4x+m}{x+1}\right) = 3x-4$, $f(5) = 2 \Rightarrow m = ?$

- A) -4 B) -3 C) 5 D) 6 E) 7

3. $f\left(\frac{ax-3}{2}\right) = x+5$, $f^{-1}(16) = 4 \Rightarrow a = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

4. $f\left(\frac{x}{2} + 3\right) = 4x - 7 \Rightarrow (f \circ f)(4) = ?$

- A) 6 B) 2 C) -10 D) -18 E) -23

5. $f(x) = 2x - 1$, $(f \circ g)(x) = 2x^2 - 4x + 3 \Rightarrow g(x) = ?$

- A) $x^2 - 2x + 1$ B) $x^2 + 2x$ C) $x^2 + 2x - 1$
D) $2x^2 - x$ E) $x^2 - 2x + 2$

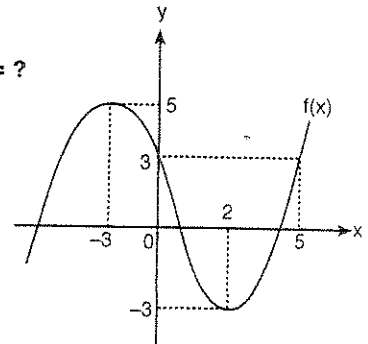
6. $(f \circ g)(x) = \frac{x}{3x-4}$, $f(x) = \frac{x+1}{x-1} \Rightarrow g(1) = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

7. $f(x) = 2x^2 + 3$, $g(x) = 3x + 4$, $(g \circ f)(-1) = f(2x) \Rightarrow x = ?$

- A) $\{-\sqrt{2}, \sqrt{2}\}$ B) $\{-1\}$ C) $\{\frac{5}{3}\}$
D) $\{-1, 1\}$ E) $\{2\}$

8. $(f \circ f)(2) + f^{-1}(3) = ?$



- A) 10 B) 9 C) 8 D) 5 E) 0

9. $f(x) = \frac{1}{x+2}$, $g(x) = x^2 \Rightarrow (g \circ f^{-1})(2) = ?$

- A) $\frac{2}{3}$ B) $\frac{5}{4}$ C) $\frac{9}{4}$ D) $\frac{7}{2}$ E) $\frac{10}{3}$

10. $f(x-1) = \frac{1}{3}x^2 + x - m$, $f(2) = 4 \Rightarrow f(1-m) = ?$

- A) -4 B) -3 C) -2 D) 2 E) 5

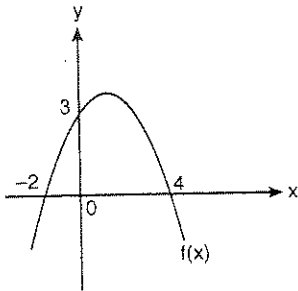
11. $f(x) = \frac{2x+1}{x-1}$, $g(x) = \frac{x+a}{2a-x}$, $(g^{-1} \circ f)(2) = 3 \Rightarrow a = ?$

- A) 5 B) 4 C) 3 D) 2 E) 1

12. $f(x) = 2x-1$, $(g \circ f)(x) = -3 \cdot f(x) \Rightarrow g(x) = ?$

- A) -3x B) -2x+1 C) -2x D) x E) -6x+3

13.



$g(x) = \begin{cases} x-3, & f(x) < 0 \\ -x+6, & f(x) > 0 \end{cases} \Rightarrow (g \circ g)(5) = ?$

- A) 2 B) 3 C) 4 D) 5 E) 6

14. $f(x) = \frac{x^2-1}{x-1}$, $g(x) = x+1 \Rightarrow (f \circ g^{-1})(3) = ?$

- A) 2 B) 3 C) 4 D) 5 E) 6

15. $f(x) = 2x+1$, $(f \circ g)(x) = \frac{x}{x-1} \Rightarrow g^{-1}\left(\frac{1}{2}\right) = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

16. $f(x) = ax+3$, $g(x) = \frac{1}{2}x-a$, $(f \circ g)^{-1}(-3) = 2 \Rightarrow a_1 \cdot a_2 = ?$

- A) -6 B) -5 C) -3 D) -2 E) -1

17. $f(x) = \frac{3x-a}{2x+1}$, $g(x) = \frac{x-1}{x+1}$, $(f^{-1} \circ g)(3) = \frac{1}{4} \Rightarrow a = ?$

- A) 0 B) 2 C) 3 D) 4 E) 5

18. $f(x) = ax+b$, $g(x) = 3x-2$, $(g \circ f)(x) = g^{-1}(x) \Rightarrow a+b = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

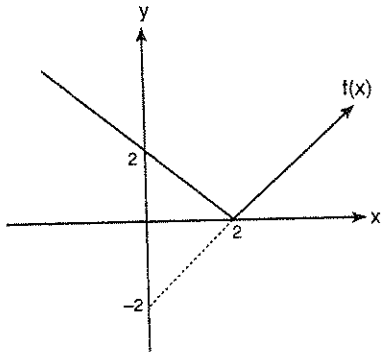
Yanıtlar / Answers

1. E	2. A	3. A	4. E	5. E	6. A
7. A	8. A	9. C	10. C	11. D	12. A
13. C	14. B	15. E	16. A	17. A	18. A

1. $f(x) = \begin{cases} x-2 & x \geq 1 \\ x+1 & x < 1 \end{cases}$
 $g(x) = \begin{cases} 3x-1 & x \geq 0 \\ 2x-1 & x < 0 \end{cases}$
 $\Rightarrow (f \circ g)(2) + (g \circ f)(-3) = ?$
A) -2 B) -1 C) 0 D) 2 E) 8
2. $f(x) = \begin{cases} -x+2 & x < 2 \\ x-2 & x \geq 2 \end{cases}$
 $\Rightarrow f(x) = ?$
A) $f(x) = |x-2|$ B) $f(x) = |x| - 2$
C) $f(x) = |x+2|$ D) $f(x) = |x-1|$
E) $f(x) = |x-3|$
3. $|4-2x| \leq 8 \Rightarrow \text{ÇK(SS)} = ?$
A) $(-2, 2)$ B) $[-2, 2]$ C) $[-2, 6]$
D) $[-6, 2]$ E) $(-2, 6)$
4. $a^2 < a$
 $\Rightarrow |1-a| + |2a-3| = ?$
A) $4-3a$ B) $a-2$ C) $3a-2$
D) $a-4$ E) $4-a$
5. $x^{2009} = -1$
 $\Rightarrow |x-3| + |x+2| + |x+3| + |x-2| = ?$
A) 4 B) 5 C) 7 D) 9 E) 10
6. $f(x) = ||x-2| + x - 1| \Rightarrow f(\sqrt{2}) = ?$
A) 1 B) 2 C) 3 D) 4 E) 5
7. $|x+y-6| + \sqrt{x-4} + (y+a)^2 = 0 \Rightarrow a = ?$
A) -4 B) -2 C) 0 D) 2 E) 4
8. $f(x) = |x-6|, g(x) = |2x+3|$
 $(f \circ g)(x) = 3 \Rightarrow \text{ÇK(SS)} = ?$
A) $\{3\}$ B) $\{0, -3, 3\}$ C) $\{0, 3\}$
D) $\{-3, 3\}$ E) $\{-6, -3, 0, 3\}$

9. $|2x^2 - x - 1| + |x - 1| = 0 \Rightarrow x = ?$
 A) -2 B) -1 C) 0 D) 1 E) 2

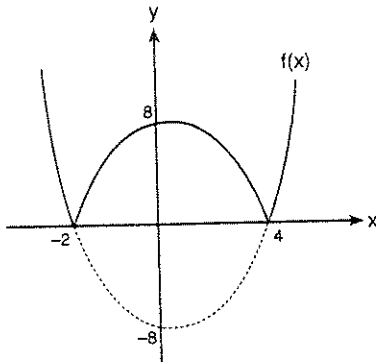
10.



$\Rightarrow f(x) = ?$

- A) $f(x) = x - 2$ B) $f(x) = |x - 2|$
 C) $f(x) = |x + 2|$ D) $f(x) = |x| - 2$
 E) $f(x) = 2 \cdot |x + 1|$

11.



$\Rightarrow f(x) = ?$

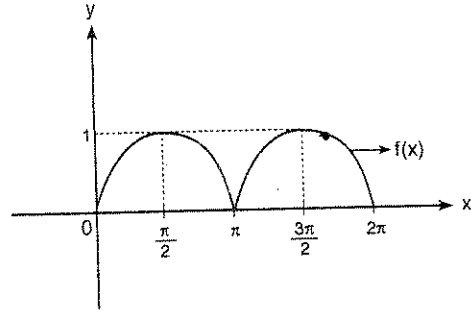
- A) $f(x) = x^2 - 2x + 8$ B) $f(x) = |x^2 - 2x| - 2$
 C) $f(x) = |2x^2 - 4x - 8|$ D) $f(x) = |x^2 + 2x - 8|$
 E) $f(x) = |x^2 - 2x - 8|$

12. $f(x) = \sin|x| + |\sin x|$

$\Rightarrow f\left(-\frac{3\pi}{2}\right) = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

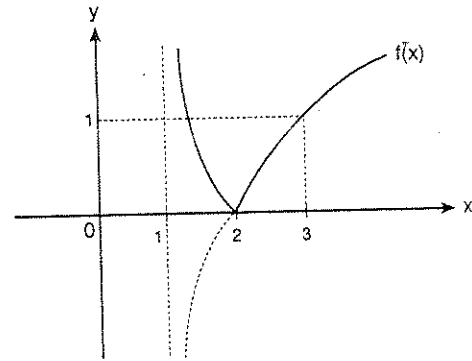
13.



$\Rightarrow f(x) = ?$

- A) $f(x) = 1 + |\cos x|$ B) $f(x) = 1 + |\sin x|$
 C) $f(x) = \sin x$ D) $f(x) = |\sin x|$
 E) $f(x) = |\sin x| + |\cos x|$

14.



$\Rightarrow f(x) = ?$

- A) $f(x) = \log_2 x$ B) $f(x) = 1 + \log_2 x$
 C) $f(x) = \log_2(x - 1)$ D) $f(x) = \log_2(x - 1)$
 E) $f(x) = 1 + \log_2(x - 1)$

Yanıtlar / Answers

1. A	2. A	3. C	4. A	5. E	6. A
7. B	8. E	9. D	10. B	11. E	12. C
13. D	14. D				

Tanım : $ax^2 + bx + c = 0$ biçimindeki eşitliklere ikinci derece denklem denir.

a, b, c sayılarına denklemin katsayıları denir. Denklemleri sağlayan sayılara **denklemin kökleri**, köklerin kümesine de **çözüm kümesi** denir.

Definition : An equation in the form of $ax^2 + bx + c = 0$ is called a second order equation.

The numbers of a, b and c are coefficients in the equation. Numbers satisfying the equation are called roots of the equation, the set containing the roots are called the solution set.

KÖKLERİN BULUNMASI / FINDING the ROOTS

1. ÇARPANLARA AYIRARAK / BY FACTORISING:

Örnek / Example :

$$x^2 - x - 20 = 0 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$x^2 - x - 20 = 0$$

$$\begin{array}{r} x \quad \quad -5 \\ x \quad \quad 4 \end{array}$$

$$4x - 5x = -x$$

$$(x - 5)(x + 4) = 0$$

$$x - 5 = 0 \text{ veya (or) } x + 4 = 0$$

$$x = 5 \text{ veya (or) } x = -4$$

$$\text{ÇK(SS)} = \{-4, 5\}$$

Örnek / Example :

$$x^2 + 2x - 35 = 0 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$x^2 + 2x - 35 = 0$$

$$\begin{array}{r} x \quad \quad 7 \\ x \quad \quad -5 \end{array}$$

$$7x - 5x = 2x$$

$$(x + 7)(x - 5) = 0$$

$$x + 7 = 0 \text{ veya (or) } x - 5 = 0 \Rightarrow x = -7 \text{ } x = 5$$

$$\text{ÇK(SS)} = \{-7, 5\}$$

2. DİSKRİMİNANT BULANARAK BY FINDING DISCRIMINANT:

$ax^2 + bx + c = 0$ denklemleri için;

$\Delta = b^2 - 4ac$ sayısına denklemin **diskriminantı** denir.

a. $\Delta > 0$ ise denklemin birbirinden farklı iki reel kökü vardır.

Bu kökler,

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a},$$

$$x_2 = \frac{-b + \sqrt{\Delta}}{2a}$$

b. $\Delta = 0$ ise denklemin birbirine eşit iki kökü vardır.

Bu kök;

$$x_1 = x_2 = -\frac{b}{2a}$$

c. $\Delta < 0$ ise denklemin reel kökü yoktur. Çözüm kümesi boş kümedir.

For the equations of $ax^2 + bx + c$,

$\Delta = b^2 - 4ac$ is called the discriminant of the equation.

a. If $\Delta > 0$, two different real roots exist. These roots are as follows:

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a}$$

$$x_2 = \frac{-b + \sqrt{\Delta}}{2a}$$

b. If $\Delta = 0$, two equal roots exist. They are as follows:

$$x_1 = x_2 = -\frac{b}{2a}$$

c. If $\Delta < 0$, no real roots exist. Solution set is an empty set.

B. $\frac{f(x)}{g(x)} = 0 \Rightarrow f(x) = 0$ ve (and) $g(x) \neq 0$

Örnek / Example :

$$\frac{2x^2 - 1}{x - 3} = x + 3 + \frac{17}{x - 3} \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$\frac{2x^2 - 1}{x - 3} = \frac{x + 3}{1} + \frac{17}{x - 3}$$

$$\frac{2x^2 - 1}{x - 3} = \frac{x^2 - 9x + 17}{x - 3}$$

$$2x^2 - 1 = x^2 + 8$$

$$x^2 - 9 = 0$$

$$(x - 3)(x + 3) = 0$$

$$x - 3 = 0 \quad x + 3 = 0$$

$$x = 3 \quad x = -3$$

$$\Rightarrow \text{ÇK(SS)} = \{-3\}$$

C. DEĞİŞKEN DEĞİŞTİREREK ÇÖZÜLEBİLEN DENKLEMLER

The EQUATIONS THAT CAN BE SOLVED BY CHANGING THE VARIABLE

Örnek / Example :

$$2\left(\frac{1}{x} - 1\right)^2 + 5\left(\frac{1}{x} - 1\right) = 3 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$\frac{1}{x} - 1 = t$$

$$2t^2 + 5t = 3$$

$$2t^2 + 5t - 3 = 0$$

$$(2t - 1)(t + 3) = 0$$

$$2t - 1 = 0 \quad t + 3 = 0$$

$$t = \frac{1}{2} \quad t = -3$$

$$\frac{1}{x} - 1 = t$$

$$\frac{1}{x} - 1 = \frac{1}{2} \quad \frac{1}{x} - 1 = -3$$

$$\frac{1}{x} = \frac{3}{2} \quad \frac{1}{x} = -2$$

$$x = \frac{2}{3} \quad x = -\frac{1}{2}$$

$$\text{ÇK(SS)} = \left\{-\frac{1}{2}, \frac{2}{3}\right\}$$

D. KÖKLÜ DENKLEMLER / EQUATIONS WITH ROOTS:

Örnek / Example :

$$\sqrt{3x+1} - x = -1 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$\sqrt{3x+1} - x = -1$$

$$\sqrt{3x+1} = x - 1$$

$$(\sqrt{3x+1})^2 = (x-1)^2$$

$$3x + 1 = x^2 - 2x + 1$$

$$x^2 - 5x = 0$$

$$x(x - 5) = 0$$

$$x = 0$$

$$x - 5 = 0$$

$$x = 5$$

$$x = 0$$

$$\sqrt{3 \cdot 0 + 1} - 0 = -1$$

$$1 - 0 = -1$$

$$1 \neq -1$$

$$x = 5$$

$$\sqrt{3 \cdot 5 + 1} - 5 = -1$$

$$4 - 5 = -1$$

$$-1 = -1$$

$$\text{ÇK(SS)} = \{5\}$$

Örnek / Example :

$$x^{\frac{4}{3}} - 5 \cdot x^{\frac{2}{3}} - 36 = 0 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$x^{\frac{4}{3}} - 5 \cdot x^{\frac{2}{3}} - 36 = 0$$

$$\sqrt[3]{x^4} - 5 \cdot \sqrt[3]{x^2} - 36 = 0$$

$$\sqrt[3]{x^4} = t \quad \sqrt[3]{x^2} = t^2$$

$$\sqrt[3]{x^4} - 5 \cdot \sqrt[3]{x^2} - 36 = 0$$

$$t^2 - 5t - 36 = 0$$

$$(t - 9)(t + 4) = 0$$

$$t - 9 = 0$$

$$t + 4 = 0$$

$$t = 9$$

$$t = -4$$

$$\sqrt[3]{x^2} = 9$$

$$\sqrt[3]{x^2} = -4$$

$$x^2 = 9^3$$

$$x^2 = 3^6$$

$$x^2 = (3^3)^2$$

$$x = 27$$

$$\text{ÇK(SS)} = \{27\}$$



KATSAYI BAĞINTILARI / RELATIONS BETWEEN ROOTS and COEFFICIENTS

$ax^2 + bx + c = 0$ denkleminde $\Delta > 0$ ise,

If $\Delta > 0$ in the equation $ax^2 + bx + c = 0$,

$$x_1 = \frac{-b + \sqrt{\Delta}}{2a}, x_2 = \frac{-b - \sqrt{\Delta}}{2a}$$

$$1. x_1 + x_2 = -\frac{b}{a}$$

$$2. x_1 \cdot x_2 = \frac{c}{a}$$

$$3. |x_1 - x_2| = \frac{\sqrt{\Delta}}{|a|}$$

$$4. \frac{1}{x_1} + \frac{1}{x_2} = -\frac{b}{c}$$

$$5. a+b+c=0 \Rightarrow \text{ÇK(SS)} = \left\{1, \frac{c}{a}\right\}$$

$$6. a-b+c=0 \Rightarrow \text{ÇK(SS)} = \left\{-1, -\frac{c}{a}\right\}$$

Örnek / Example :

$$2x^2 - 3x - 1 = 0$$

$$\Rightarrow x_1 + x_2 = ?$$

$$\Rightarrow x_1 \cdot x_2 = ?$$

Çözüm / Solution:

$$2x^2 - 3x - 1 = 0$$

$$a = 2, b = -3, c = -1$$

$$x_1 + x_2 = -\frac{b}{a} = -\frac{-3}{2} = \frac{3}{2}$$

$$x_1 \cdot x_2 = \frac{c}{a} = -\frac{1}{2}$$

Örnek / Example :

$$x^2 + 7x + m = 7$$

$$x_1 \cdot x_2 = 10 \Rightarrow m = ?$$

Çözüm / Solution:

$$x^2 + 7x + m - 7 = 0$$

$$a = 1, b = 7, c = m - 7$$

$$x_1 \cdot x_2 = 10$$

$$\frac{c}{a} = 10$$

$$\frac{m-7}{1} = 10$$

$$m = 17$$

Örnek / Example :

$$2x^2 - 7x + 3 = 0$$

$$\Rightarrow x_1^2 \cdot x_2 + x_1 \cdot x_2^2 = ?$$

Çözüm / Solution:

$$\begin{aligned} x_1^2 \cdot x_2 + x_1 \cdot x_2^2 &= x_1 \cdot x_2 (x_1 + x_2) \\ &= \frac{c}{a} \cdot \left(-\frac{b}{a}\right) \\ &= -\frac{c \cdot b}{a^2} \\ &= -\frac{3 \cdot (-7)}{2^2} \\ &= \frac{21}{4} \end{aligned}$$

Örnek / Example :

$$2x^2 - 7x + m - 4 = 0$$

$$3x_1 + 4x_2 = 1$$

$$\Rightarrow m = ?$$

Çözüm / Solution:

$$2x^2 - 7x + m - 4 = 0$$

$$x_1 + x_2 = -\frac{b}{a} \Rightarrow x_1 + x_2 = \frac{7}{2}$$

$$3x_1 + 4x_2 = 1$$

$$-4x_1 - 4x_2 = -14$$

$$+ 3x_1 + 4x_2 = 1$$

$$-x_1 = -13$$

$$x_1 = 13$$

$$13 + x_2 = \frac{7}{2}$$

$$x_2 = \frac{7}{2} - 13$$

$$x_2 = -\frac{19}{2}$$

$$x_1 \cdot x_2 = 13 \cdot \left(-\frac{19}{2}\right) = -\frac{247}{2}$$

$$\frac{m-4}{2} = -\frac{247}{2}$$

$$m = -243$$



**KÖKLERİ VERİLEN İKİNCİ DERECEDEN
DENKLEMLERİN YAZILMASI**

**FINDING THE SECOND ORDER EQUATION WITH
CERTAIN ROOTS**

Kökleri x_1 ve x_2 olan ikinci dereceden bir bilinmeyenli denklem genel olarak,

$$a \cdot (x - x_1) \cdot (x - x_2) = 0$$

şeklinde yazılır.

The second order equation with one unknown and with roots x_1 and x_2 is written in general as follow,

$$a \cdot (x - x_1) \cdot (x - x_2) = 0$$

Örnek / Example :

$$f(x) = ax^2 + bx + c$$

$$f(2) = f(-1) = 0$$

$$f(3) = 8 \Rightarrow f(x) = ?$$

$$A) 2x^2 - 2x - 4$$

$$B) 2x^2 - 2x + 4$$

$$C) 2x^2 + 2x - 4$$

$$D) 2x^2 + 2x + 4$$

$$E) x^2 - 2x - 4$$

Çözüm / Solution:

$$f(x) = a \cdot (x - x_1) \cdot (x - x_2)$$

$$f(x) = a \cdot (x - 2) \cdot (x + 1)$$

$$f(x) = a \cdot (x^2 - x - 2)$$

$$f(3) = 8 \Rightarrow a(3^2 - 3 - 2) = 8$$

$$4 \cdot a = 8$$

$$a = 2$$

$$\Rightarrow f(x) = 2 \cdot (x^2 - x - 2)$$

$$= 2x^2 - 2x - 4$$

Yanıt / Answer A

ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

$$1. \quad x^2 + 4x - 21 = 0 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\{-7, -3\}$ B) $\{-3, 7\}$ C) $\{-4, -3\}$
D) $\{-7, 3\}$ E) $\{3, 7\}$

Çözüm / Solution:

$$x^2 + 4x - 21 = 0$$

$$\Delta = b^2 - 4ac$$

$$\Delta = 4^2 - 4 \cdot 1 \cdot (-21)$$

$$\Delta = 16 + 84$$

$$\Delta = 100$$

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a}$$

$$= \frac{-4 - \sqrt{100}}{2 \cdot 1}$$

$$= \frac{-4 - 10}{2}$$

$$= -7$$

$$\text{ÇK (SS)} = \{-7, 3\}$$

$$x_2 = \frac{-b + \sqrt{\Delta}}{2a}$$

$$= \frac{-4 + \sqrt{100}}{2 \cdot 1}$$

$$= \frac{-4 + 10}{2}$$

$$= 3$$

Yanıt / Answer D

$$2. \quad x^2 - x - 6 = 0 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\{-3, -2\}$ B) $\{-2, -3\}$ C) $\{-2, 3\}$
D) $\{-3, 2\}$ E) $\{2, 3\}$

Çözüm / Solution:

$$x^2 - x - 6 = 0$$

$$\Delta = (-1)^2 - 4 \cdot 1 \cdot (-6)$$

$$= 1 + 24 = 25$$

$$x_1 = \frac{-(-1) - \sqrt{25}}{2 \cdot 1}$$

$$= \frac{1 - 5}{2} = -2$$

$$\text{ÇK (SS)} = \{-2, 3\}$$

$$x_2 = \frac{-(-1) + \sqrt{25}}{2 \cdot 1}$$

$$= \frac{1 + 5}{2} = 3$$

Yanıt / Answer C

3. $x^2 + 5x = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{-5, 0\}$ B) $\{-5\}$ C) $\{0, 5\}$
D) $\{-3, 2\}$ E) $\{2, 3\}$

Çözüm / Solution:

$$\begin{aligned} x^2 + 5x &= 0 \\ x \cdot (x + 5) &= 0 \\ x &= 0 \text{ veya (or) } x + 5 = 0 \\ x &= -5 \end{aligned}$$

$\text{ÇK (SS)} = \{-5, 0\}$

Yanıt / Answer A

4. $x^2 + 4 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) R B) $\emptyset$ C) $\{-2\}$
D) $\{-4\}$ E) $\{4\}$

Çözüm / Solution:

$$\begin{aligned} x^2 + 4 &= 0 \\ x^2 &= -4 \Rightarrow \text{ÇK (SS)} = \emptyset \end{aligned}$$

Yanıt / Answer B

5. $x^2 - 8x + 16 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{2, 4\}$ B) $\{-2\}$ C) $\{2\}$
D) $\{-4\}$ E) $\{4\}$

Çözüm / Solution:

$$\begin{aligned} x^2 - 8x + 16 &= 0 \\ \Delta &= (-8)^2 - 4 \cdot 1 \cdot 16 \\ \Delta &= 64 - 64 \\ \Delta &= 0 \end{aligned}$$

$$x_1 = x_2 = \frac{-b - \sqrt{\Delta}}{2a}$$

$$= \frac{-(-8) - \sqrt{0}}{2 \cdot 1}$$

$$= \frac{8}{2} = 4$$

$\text{ÇK (SS)} = \{4\}$

Yanıt / Answer E

6. $x \cdot (2 - x) + m + 1 = 0, x_1 = x_2 \Rightarrow m = ?$

- A) -4 B) -2 C) 0 D) 2 E) 4

Çözüm / Solution:

$$\begin{aligned} x \cdot (2 - x) + m + 1 &= 0 \\ 2x - x^2 + m + 1 &= 0 \\ -x^2 + 2x + m + 1 &= 0 \\ x_1 = x_2 \Rightarrow \Delta &= 0 \\ \Delta &= 2^2 - 4 \cdot (-1) \cdot (m + 1) \\ &= 4 + 4 \cdot (m + 1) \\ &= 4 + 4m + 4 \\ &= 8 + 4m \\ 8 + 4m &= 0 \\ 4m &= -8 \\ m &= -2 \end{aligned}$$

Yanıt / Answer B

7. $2 \cdot (x - 3)^2 - (x - 3) = x - 3 \Rightarrow x_1 + x_2 = ?$

- A) 5 B) 6 C) 7 D) 8 E) 9

Çözüm / Solution:

$$\begin{aligned} 2 \cdot (x - 3)^2 - (x - 3) &= x - 3 \\ 2 \cdot (x^2 - 6x + 9) - x + 3 &= x - 3 \\ 2x^2 - 12x + 18 - x + 3 &= x - 3 \\ 2x^2 - 12x + 18 - x + 3 - x + 3 &= 0 \\ 2x^2 - 14x + 24 &= 0 \\ x^2 - 7x + 12 &= 0 \\ x_1 + x_2 &= -\frac{b}{a} \\ x_1 + x_2 &= -\frac{(-7)}{1} = 7 \end{aligned}$$

Yanıt / Answer C

8. $x + 2 + \frac{m+2}{x-2} = 1, x_1 \cdot x_2 = 2 \Rightarrow m = ?$

- A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution:

$$\frac{x+2}{1} + \frac{m+2}{x-2} = 1$$

$$\frac{x^2-4+m+2}{x-2} = 1$$

$$\frac{x^2+m-2}{x-2} = 1$$

$$x^2+m-2=x-2$$

$$x^2-x+m=0$$

$$x_1 \cdot x_2 = \frac{c}{a}$$

$$m=2$$

Yanıt / Answer A

9. $x^2 + (m-2)x + m = 0$

$$(x_1-1) \cdot (x_2-1) = 1 \Rightarrow m = ?$$

A) -2 B) -1 C) 0 D) 1 E) 2

Çözüm / Solution:

$$x^2 + (m-2)x + m = 0$$

$$(x_1-1) \cdot (x_2-1) = 1$$

$$x_1 \cdot x_2 - x_1 - x_2 + 1 = 1$$

$$x_1 \cdot x_2 - (x_1 + x_2) = 0$$

$$\frac{m}{1} - \left(-\frac{(m-2)}{1}\right) = 0$$

$$m + m - 2 = 0$$

$$2m = 2$$

$$m = 1$$

Yanıt / Answer D

10. $\frac{x^2-7x+10}{x-5} = 0 \Rightarrow \text{ÇK (SS)} = ?$

A) {2,5} B) {5} C) {2}

D) Ø E) R

Çözüm / Solution:

$$\frac{x^2-7x+10}{x-5} = 0$$

$$x^2-7x+10=0$$

$$(x-5)(x-2)=0$$

$$x-5=0 \text{ veya (or) } x-2=0$$

$$x=5 \quad x=2$$

$$\text{ÇK (SS)} = \{2\}$$

Yanıt / Answer C

11. $x^2 - (m+2)x + 2m = 0, \frac{1}{x_1} + \frac{1}{x_2} = \frac{5}{6} \Rightarrow m = ?$

A) -3 B) -1 C) 0 D) 1 E) 3

Çözüm / Solution:

$$x^2 - (m+2)x + 2m = 0$$

$$\frac{1}{x_1} + \frac{1}{x_2} = \frac{5}{6}$$

$$\frac{x_1+x_2}{x_1 \cdot x_2} = \frac{5}{6}$$

$$\frac{m+2}{2m} = \frac{5}{6} \Rightarrow 6m+12=10m$$

$$-4m = -12$$

$$m = 3$$

Yanıt / Answer E

12. $3^x + \frac{1}{3^x} - \frac{10}{3} = 0 \Rightarrow x_1 + x_2 = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

Çözüm / Solution:

$$3^x + \frac{1}{3^x} - \frac{10}{3} = 0$$

$$3^x = t$$

$$\frac{t}{(3t)} + \frac{1}{t} - \frac{10}{3} = 0$$

$$\frac{3t^2+3-10t}{3t} = 0$$

$$3t^2-10t+3=0$$

$$(3t-1) \cdot (t-3) = 0$$

$$3t-1=0 \text{ veya (or) } t-3=0$$

$$t = \frac{1}{3}$$

$$t = 3$$

$$3^x = \frac{1}{3} = 3^{-1}$$

$$3^x = 3$$

$$x = -1$$

$$x = 1$$

$$x_1 + x_2 = (-1) + 1 = 0$$

Yanıt / Answer C

13. $x^2 + (2m - 4)x + m - 9 = 0, x_1 = -5 \Rightarrow x_2 = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

Çözüm / Solution:

$$x^2 + (2m - 4)x + m - 9 = 0$$

$$x_1 = -5 \Rightarrow (-5)^2 + (2m - 4) \cdot (-5) + m - 9 = 0$$

$$25 - 10m + 20 + m - 9 = 0$$

$$-9m + 36 = 0$$

$$-9m = -36$$

$$m = 4$$

$$x^2 + 4x - 5 = 0$$

$$(x + 5)(x - 1) = 0$$

$$x = -5 \text{ veya (or) } x = 1$$

Yanıt / Answer D

14. $\frac{x-10}{x^2+x} - \frac{x}{x+1} + \frac{4}{x} = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{-1, 2\}$ B) $\{1, 2\}$ C) $\{1, 3\}$
D) $\{2, 3\}$ E) $\{-4, -3\}$

Çözüm / Solution:

$$\frac{x-10}{x^2+x} - \frac{x}{x+1} + \frac{4}{x} = 0$$

$$\frac{x-10-x^2+4x+4}{x^2+x} = 0$$

$$x-10-x^2+4x+4=0$$

$$-x^2+5x-6=0$$

$$\Delta = 5^2 - 4 \cdot (-1) \cdot (-6)$$

$$= 25 - 24$$

$$= 1$$

$$x_1 = \frac{-5 - \sqrt{1}}{2 \cdot (-1)} = 3$$

$$x_2 = \frac{-5 + \sqrt{1}}{2 \cdot (-1)} = 2$$

$$\text{ÇK(SS)} = \{2, 3\}$$

Yanıt / Answer D

15. $x^2 - 3mx - 3m + 1 = 0, 2x_1 + x_2 = 1 \Rightarrow m = ?$

- A) $-\frac{1}{2}$ B) $-\frac{1}{3}$ C) 0 D) $\frac{1}{3}$ E) $\frac{1}{2}$

Çözüm / Solution:

$$2x_1 + x_2 = 1$$

$$x_1 + x_2 = \frac{-(-3m)}{1}$$

$$2x_1 + x_2 = 1$$

$$x_1 + x_2 = 3m$$

$$+ -x_1 - x_2 = -3m$$

$$x_1 = 1 - 3m$$

$$x^2 - 3mx - 3m + 1 = 0$$

$$(1 - 3m)^2 - 3m \cdot (1 - 3m) - 3m + 1 = 0$$

$$1 - 6m + 9m^2 - 3m + 9m^2 - 3m + 1 = 0$$

$$18m^2 - 12m + 2 = 0$$

$$9m^2 - 6m + 1 = 0$$

$$(3m - 1)^2 = 0$$

$$3m - 1 = 0$$

$$3m = 1$$

$$m = \frac{1}{3}$$

Yanıt / Answer D

16. $3x^2 - 2kx + 12 = 0, x_1 = x_2 \Rightarrow k = ?$

- A) 4 B) 5 C) 6 D) 7 E) 8

Çözüm / Solution:

$$x_1 = x_2 \Rightarrow \Delta = 0$$

$$\Delta = (-2k)^2 - 4 \cdot 3 \cdot 12$$

$$\Delta = 4k^2 - 144$$

$$4k^2 - 144 = 0$$

$$4k^2 = 144, k^2 = 36, k = \pm 6$$

Yanıt / Answer C

17. $\left. \begin{array}{l} 2x + y = 8 \\ 4x^2 - y^2 = 32 \end{array} \right\} \Rightarrow (x, y) = ?$

- A) (3, 4) B) (5, -2) C) (4, $4\sqrt{2}$)
D) (4, 0) E) (3, 2)

Çözüm / Solution:

$$2x + y = 8 \dots (I) \quad 4x^2 - y^2 = 32$$

$$(2x - y)(2x + y) = 32$$

$$(2x - y) \cdot 8 = 32$$

$$2x - y = 4 \dots (II)$$

$$2x + y = 8 \dots (I)$$

$$+ 2x - y = 4 \dots (II)$$

$$4x = 12$$

$$\boxed{x = 3} \quad \boxed{y = 2}$$

Yanıt / Answer E

18. $x_1 = 1 - \sqrt{3}$, $x_2 = 1 + \sqrt{3} \Rightarrow ax^2 + bx + c = ?$

- A) $x^2 - 2x - 2 = 0$ B) $x^2 - x - 2 = 0$
 C) $x^2 - 2x - 1 = 0$ D) $x^2 - 2x = 0$
 E) $x^2 + 2x - 2 = 0$

Çözüm / Solution:

$$\begin{aligned} x^2 - (x_1 + x_2)x + x_1 \cdot x_2 &= 0 \\ x_1 + x_2 &= 1 - \sqrt{3} + 1 + \sqrt{3} \\ x_1 + x_2 &= 2 \\ x_1 \cdot x_2 &= (1 - \sqrt{3}) \cdot (1 + \sqrt{3}) \\ &= 1 + \sqrt{3} - \sqrt{3} - 3 \\ &= -2 \\ x^2 - 2x - 2 &= 0 \end{aligned}$$

Yanıt / Answer A

www.douknowturkey.com

19. $x^2 - 3x + m - 2 = 0$,
 $x_1^2 - x_2^2 = 6 \Rightarrow m = ?$

- A) -4 B) $\frac{3}{4}$ C) $\frac{6}{5}$ D) $\frac{13}{4}$ E) $\frac{15}{4}$

Çözüm / Solution:

$$\begin{aligned} x^2 - 3x + m - 2 &= 0 \\ x_1^2 - x_2^2 &= 6 \\ (x_1 - x_2) \cdot (x_1 + x_2) &= 6 \\ \frac{\sqrt{\Delta}}{|a|} \cdot \frac{-b}{a} &= 6 \\ \frac{\sqrt{(-3)^2 - 4 \cdot 1 \cdot (m-2)}}{1} \cdot \frac{3}{1} &= 6 \\ \sqrt{9 - 4m + 8} \cdot 3 &= 6 \\ \sqrt{17 - 4m} &= 2 \\ 17 - 4m &= 4 \\ 13 &= 4m \\ \frac{13}{4} &= m \end{aligned}$$

Yanıt / Answer D

YÖS SORULARI / YÖS QUESTIONS

1. $2x^2 - (m-1)x - (4-m) = 0$

$x_1 = \frac{1}{x_2} \Rightarrow m = ?$

- A) $-\frac{3}{2}$ B) -1 C) 2 D) 4 E) 6

(YÖS 1991)

Çözüm / Solution:

$2x^2 - (m-1)x - (4-m) = 0$

$x_1 = \frac{1}{x_2} \Rightarrow x_1 \cdot x_2 = 1$

$\frac{c}{a} = 1$

$\frac{-(4-m)}{2} = 1$

$-4 + m = 2$

$m = 6$

Yanıt / Answer E

2.

$0 < x$, $\frac{\frac{2}{x}}{3} - \frac{3}{\frac{2}{x}} = 0 \Rightarrow x = ?$

- A) $\frac{3}{2}$ B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) $\frac{1}{3}$ E) 1

(YÖS 1991)

Çözüm / Solution:

$0 < x$, $\frac{\frac{2}{x}}{3} - \frac{3}{\frac{2}{x}} = 0$

$\frac{\frac{2}{x}}{3} - \frac{3x}{2} = 0$
 (2) (3x)

$\frac{4 - 9x^2}{6x} = 0$

$(2 - 3x)(2 + 3x) = 0$

$2 - 3x = 0$ veya (or) $2 + 3x = 0$

$x = \frac{2}{3}$

$x = -\frac{2}{3}$

$x > 0$

$x = \frac{2}{3}$

Yanıt / Answer C

3. $2x^2 + kx - 3 = 0$, $x_1 + x_2 = 1 \Rightarrow k = ?$

- A) 3 B) 2 C) 1 D) -1 E) -2

(YÖS 1992)

Çözüm / Solution:

$$2x^2 + kx - 3 = 0$$

$$x_1 + x_2 = 1$$

$$\frac{-k}{2} = 1 \Rightarrow k = -2$$

Yanıt / Answer E

4. $x^2 + (b-2)x + b = 0$, $\frac{1}{x_1} + \frac{1}{x_2} = 3 \Rightarrow b = ?$

- A) $-\frac{1}{3}$ B) $-\frac{1}{2}$ C) -1 D) $\frac{1}{2}$ E) $\frac{1}{3}$

(YÖS 1992)

Çözüm / Solution:

$$x^2 + (b-2)x + b = 0$$

$$\frac{1}{x_1} + \frac{1}{x_2} = 3 \Rightarrow \frac{x_1 + x_2}{x_1 \cdot x_2} = 3$$

$$\frac{-(b-2)}{b} = 3$$

$$-b+2 = 3b \Rightarrow 2 = 4b \Rightarrow b = \frac{1}{2}$$

Yanıt / Answer D

5. $x \in \mathbb{Z}$, $(m+1)^{2x} = (9m^2 + 12m + 4)^x$
 $\Rightarrow m_1 + m_2 = ?$

- A) $-\frac{5}{4}$ B) $-\frac{3}{2}$ C) -1 D) 1 E) $\frac{3}{2}$

(YÖS 1994)

Çözüm / Solution:

$$((m+1)^2)^x = (9m^2 + 12m + 4)^x$$

$$(m+1)^2 = 9m^2 + 12m + 4$$

$$m^2 + 2m + 1 = 9m^2 + 12m + 4$$

$$0 = 9m^2 + 12m + 4 - m^2 - 2m - 1$$

$$0 = 8m^2 + 10m + 3$$

$$8m^2 + 10m + 3 = 0$$

$$m_1 + m_2 = -\frac{10}{8}$$

$$= -\frac{5}{4}$$

Yanıt / Answer A

6. $a \cdot (x+1)^2 - x + 1 = 8$

$$x_1 \cdot x_2 = -\frac{2}{5} \Rightarrow a = ?$$

- A) 1 B) 2 C) 4 D) 5 E) 8

(YÖS 1994)

Çözüm / Solution:

$$a \cdot (x+1)^2 - x + 1 = 8$$

$$a \cdot (x^2 + 2x + 1) - x + 1 = 8$$

$$ax^2 + 2ax + a - x + 1 - 8 = 0$$

$$ax^2 + (2a-1)x + a-7 = 0$$

$$x_1 \cdot x_2 = -\frac{2}{5}$$

$$\frac{a-7}{a} = -\frac{2}{5}$$

$$5a - 35 = -2a$$

$$7a = 35$$

$$a = 5$$

Yanıt / Answer D

7. $a \neq 0$, $ax^2 - 8ax + 8 \cdot (a+2) = 0$

$$x_1 = x_2 \Rightarrow a = ?$$

- A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 3 D) 2 E) 1

(YÖS 1995)

Çözüm / Solution:

$$ax^2 - 8ax + 8 \cdot (a+2) = 0$$

$$x_1 = x_2 \Rightarrow \Delta = 0$$

$$(-8a)^2 - 4 \cdot a \cdot 8 \cdot (a+2) = 0$$

$$64a^2 - 32a^2 - 64a = 0$$

$$32a^2 - 64a = 0$$

$$a^2 - 2a = 0$$

$$a \cdot (a-2) = 0$$

$$a = 0 \text{ veya (or) } a = 2$$

Yanıt / Answer D

8. $\frac{1}{3^x+1} + \frac{8}{9^x-1} = \frac{1}{5} \Rightarrow x = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

(YÖS 1997)

Çözüm / Solution:

$$\frac{1}{3^x + 1} + \frac{8}{9^x - 1} = \frac{1}{5}$$

$$(3^x - 1)$$

$$\frac{3^x - 1 + 8}{9^x - 1} = \frac{1}{5}$$

$$9^x - 1 = 5 \cdot 3^x + 35$$

$$9^x - 5 \cdot 3^x - 36 = 0$$

$$(3^x - 9) \cdot (3^x + 4) = 0$$

$$3^x = 9 \Rightarrow x = 2$$

Yanıt / Answer C

9. $x^2 + bx + 9 = 0$

$$x_1 \cdot x_2 = \frac{3}{2} (x_1 + x_2) \Rightarrow b = ?$$

A) 6 B) 3 C) -1 D) -3 E) -6

(YÖS 1997)

Çözüm / Solution:

$$x_1 \cdot x_2 = \frac{3}{2} (x_1 + x_2)$$

$$\frac{9}{1} = \frac{3}{2} \cdot (-\frac{b}{1})$$

$$-6 = b$$

Yanıt / Answer E

10. $x^2 + 3x + 2 = 0 \Rightarrow \frac{x_1}{x_2} + \frac{x_2}{x_1} = ?$

A) $-\frac{5}{2}$ B) $-\frac{3}{2}$ C) $\frac{3}{2}$ D) $\frac{5}{2}$ E) 1

(YÖS 1998)

Çözüm / Solution:

$$x^2 + 3x + 2 = 0$$

$$\frac{x_1}{x_2} + \frac{x_2}{x_1} = \frac{x_1^2 + x_2^2}{x_1 \cdot x_2}$$

$$= \frac{(x_1 + x_2)^2 - 2x_1 \cdot x_2}{x_1 \cdot x_2} = \frac{(-3)^2 - 2 \cdot 2}{2}$$

$$= \frac{9 - 4}{2} = \frac{5}{2}$$

Yanıt / Answer D

11. $0 < x, \frac{1}{x} + \frac{1}{2x+1} = 1 \Rightarrow x = ?$

A) $1 + \sqrt{3}$ B) $2 + \sqrt{3}$ C) $\frac{1 - \sqrt{3}}{4}$

D) $\frac{1 + \sqrt{3}}{4}$ E) $\frac{1 + \sqrt{3}}{2}$

(YÖS 2001)

Çözüm / Solution:

$$3x + 1 = 2x^2 + x$$

$$\Rightarrow 2x^2 - 2x - 1 = 0$$

$$\Delta = (-2)^2 - 4 \cdot (2) \cdot (-1) = 12$$

$$x_1 = \frac{2 + 2\sqrt{3}}{4} = \frac{1 + \sqrt{3}}{2} > 0,$$

$$x_2 = \frac{2 - 2\sqrt{3}}{4} = \frac{1 - \sqrt{3}}{2} < 0$$

Yanıt / Answer E

12. $x^2 - ax + 14 = 0, S = \{x_1, x_2\}$

$$\frac{x_1}{x_2} + \frac{x_2}{x_1} = \frac{53}{14} \Rightarrow a^2 = ?$$

A) 36 B) 49 C) 64 D) 81 E) 100

(YÖS 2003)

Çözüm / Solution:

$$\frac{x_1}{x_2} + \frac{x_2}{x_1} = \frac{53}{14} \Rightarrow \frac{x_1^2 + x_2^2}{x_1 \cdot x_2} = \frac{53}{14}$$

$$\frac{x_1^2 + x_2^2}{x_1 \cdot x_2} = \frac{b^2 - 2ac}{a^2}$$

$$\frac{a^2 - 28}{14} = \frac{53}{14}$$

$$a^2 = 81$$

Yanıt / Answer D

13. $x^2 - 2x + 8a = 0$

$x_1 \cdot x_2 \cdot (x_1 + x_2) = -48 \Rightarrow a = ?$

- A) -6 B) -3 C) -2 D) 4 E) 6

(YÖS 2004)

Çözüm / Solution:

$x_1 \cdot x_2 \cdot (x_1 + x_2) = -48$

$\frac{8a}{1} \cdot \frac{2}{1} = -48$

$16a = -48$

$a = -3$

Yanıt / Answer B

14. $\frac{1}{x+1} + \frac{1}{x^2+2x+1} = 0$

$x = ?$

- A) -8 B) -4 C) -2 D) 2 E) 4

(YÖS 2005)

Çözüm / Solution:

$\frac{1}{x+1} + \frac{1}{(x+1)^2} = 0 \Rightarrow \frac{x+1+1}{(x+1)^2} = 0$

$\frac{x+2}{(x+1)^2} = 0 \Rightarrow x+2 = 0$

$x = -2$

Yanıt / Answer C

15. $x^2 - x - 2 = 0$

$x^4 - 2x^3 + x^2 = ?$

- A) 2 B) 3 C) 4 D) 6 E) 8

(YÖS 2005)

Çözüm / Solution:

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0$

$x_1 = 2 \quad x_2 = -1 \Rightarrow x^4 - 2x^3 + x^2$

$x = 2 \Rightarrow 2^4 - 2 \cdot 2^3 + 2^2 = 4$

$x = -1 \Rightarrow (-1)^4 - 2(-1)^3 + (-1)^2 = 4$

Yanıt / Answer C

16. $f(x) = x + \frac{2}{x} - 3$

$f(x_1) = f(x_2) = 0$

$x_1 + x_2 = ?$

- A) -4 B) -3 C) 1 D) 2 E) 3

(YÖS 2006)

Çözüm / Solution:

$x + \frac{2}{x} - 3 = 0$

$x^2 - 3x + 2 = 0$

$\Rightarrow x_1 + x_2 = \frac{(-3)}{1} = 3$

Yanıt / Answer E

17. $f(x) = x^2 - (a+1)x + 3a + 4$

$f(x_1) = f(x_2) = 0$

$x_1 + x_2 = k$

$x_1 \cdot x_2 = m \Rightarrow m = ?$

- A) $k+1$ B) $3k+1$ C) $1-3k$

D) $\frac{5k-2}{3}$ E) $\frac{6k+1}{2}$

(YÖS 2007)

Çözüm / Solution:

$x^2 - (a+1)x + 3a + 4 = 0$

$\Rightarrow a = k - 1$

$\Rightarrow x_1 + x_2 = a + 1 = k$

$x_1 \cdot x_2 = 3a + 4 = m$

$= 3(k-1) + 4 = m$

$3k + 1 = m$

Yanıt / Answer B

18. $2^{4x+1} - 2^{2x+2} = 96 \Rightarrow x = ?$

- A) 1 B) 2 C) 3 D) $\frac{3}{2}$ E) $\frac{5}{2}$

(YÖS 2007)

Çözüm / Solution

$2^{4x+1} - 2^{2x+2} = 96$

$2 \cdot 2^{4x} - 4 \cdot 2^{2x} = 96$

$2^{2x} = u$

$2u^2 - 4u = 96$

$u^2 - 2u - 48 = 0$

$u_1 = 8 \quad u_2 = -6$

$2^{2x} = 2^3 \quad 2^{2x} \neq -6$

$x = \frac{3}{2}$

Yanıt / Answer D

EŞİTSİZLİKLER / INEQUALITIES

Tanım: $f(x) \geq 0$, $f(x) \leq 0$, $f(x) > 0$, $f(x) < 0$ biçimindeki ifadeler eşitsizlik denir.

Definition : The expressions $f(x) \geq 0$, $f(x) \leq 0$, $f(x) > 0$, $f(x) < 0$ are called inequalities.

1. $f(x) = ax + b$

x	$-\infty$	$-\frac{b}{a}$	$+\infty$
$ax + b$	a'nın işaretinin tersi The opposite with the sign of a	a'nın işaretinin aynısı The same with the sign of a	

2. $f(x) = ax^2 + bx + c$

i. $\Delta < 0 \Rightarrow$

x	$-\infty$	$+\infty$
$ax^2 + bx + c$	a'nın işaretinin aynısı The same with the sign of a	

ii. $\Delta = 0 \Rightarrow$

x	$-\infty$	$-\frac{b}{2a}$	$+\infty$
$ax^2 + bx + c$	a'nın işaretinin aynısı The same with the sign of a	a'nın işaretinin aynısı The same with the sign of a	

iii. $\Delta > 0 \Rightarrow$

x	$-\infty$	x_1	x_2	$+\infty$
$ax^2 + bx + c$	a'nın işaretinin aynısı / The same with the sign of a	a'nın işaretinin tersi / The opposite of a	a'nın işareti aynısı / The same with the sign	

$$\begin{aligned} \{x \mid m \leq x \leq n; \quad m, n \in \mathbb{R}\} &= [m, n] \\ \{x \mid m \leq x < n; \quad m, n \in \mathbb{R}\} &= [m, n) \\ \{x \mid m < x \leq n; \quad m, n \in \mathbb{R}\} &= (m, n] \\ \{x \mid m < x < n; \quad m, n \in \mathbb{R}\} &= (m, n) \end{aligned}$$

Örnek (Example) :

$$x^2 < 12 - 4x \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm (Solution) :

$$\begin{aligned} x^2 < 12 - 4x & \quad x^2 + 4x - 12 = 0 \\ x^2 + 4x - 12 < 0 & \quad (x + 6)(x - 2) = 0 \\ x + 6 = 0 & \quad x - 2 = 0 \\ x = -6 & \quad x = 2 \end{aligned}$$

x	$-\infty$	-6	2	$+\infty$
$x^2 + 4x - 12$	+	0	0	+

$$\text{ÇK(SS)} = \{x \mid -6 < x < 2, x \in \mathbb{R}\}$$

$$\text{ÇK(SS)} = (-6, 2)$$

Örnek (Example) :

$$-6x^2 + 51x - 105 \leq 0 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm (Solution) :

$$-6x^2 + 51x - 105 = 0$$

$$6x^2 - 51x + 105 = 0$$

$$\begin{array}{l} 2x \quad -7 \\ 3x \quad -15 \end{array}$$

$$6x^2 - 51x + 105 = 0$$

$$(2x - 7)(3x - 15) = 0$$

$$2x - 7 = 0$$

$$3x - 15 = 0$$

$$x = \frac{7}{2}$$

$$x = 5$$

x	$-\infty$	$\frac{7}{2}$	5	$+\infty$
$-6x^2 + 51x - 105$	-	0	0	-

$$\text{ÇK(SS)} = \{x \mid -\infty < x \leq \frac{7}{2} \text{ veya (or) } 5 \leq x < +\infty, x \in \mathbb{R}\}$$

$$\text{ÇK(SS)} = (-\infty, \frac{7}{2}] \cup [5, +\infty)$$

ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

1. $2x - 6 > 0 \Rightarrow x = ?$

- A) $x < -6$ B) $x < -3$ C) $x < 3$
D) $x > 3$ E) $x > -3$

Çözüm / Solution:

$$2x - 6 > 0$$

$$2x - 6 = 0$$

$$x = 3$$

x	$-\infty$	3	$+\infty$
$2x - 6$	-	0	+

$$\text{ÇK (SS)} = \{x \mid x > 3, x \in \mathbb{R}\}$$

Yanıt / Answer D

2. $3 - 6x \leq 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $[-\frac{1}{2}, \infty)$ B) $(\frac{1}{2}, \infty)$ C) $[\frac{1}{2}, \infty)$
D) $(-\frac{1}{2}, \infty)$ E) $(-\frac{1}{2}, \frac{1}{2})$

Çözüm / Solution:

$$3 - 6x \leq 0$$

$$3 - 6x = 0$$

$$6x = 3$$

$$x = \frac{1}{2}$$

x	$-\infty$	$\frac{1}{2}$	$+\infty$
$3 - 6x$	+	0	-

$$\text{ÇK (SS)} = \{x \mid x \geq \frac{1}{2}, x \in \mathbb{R}\} = [\frac{1}{2}, \infty)$$

Yanıt / Answer C

3. $\frac{x-1}{2-x} > 0 \Rightarrow ? < x < ?$

- A) $-2 < x < 1$ B) $1 < x < 2$ C) $-1 < x < 2$
D) $0 < x < 2$ E) $1 < x < 3$

Çözüm / Solution:

$$\frac{x-1}{2-x} > 0$$

$$x-1=0 \Rightarrow x=1$$

$$2-x=0 \Rightarrow x=2$$

x	$-\infty$	1	2	$+\infty$
$x-1$	-	0	+	+
$2-x$	+	+	0	-
$\frac{x-1}{2-x}$	-	+	-	-

$$1 < x < 2$$

Yanıt / Answer B

4. $\frac{x+1}{x^2+4} \geq 0 \Rightarrow ? \leq x \leq ?$

- A) $-1 \leq x < \infty$ B) $-2 \leq x < \infty$ C) $-3 \leq x < \infty$
D) $-4 \leq x < \infty$ E) $-5 \leq x < \infty$

Çözüm / Solution:

$$\frac{x+1}{x^2+4} \geq 0$$

$$x+1=0 \Rightarrow x=-1$$

$$x^2+4=0 \Rightarrow x \notin \mathbb{R}$$

x	$-\infty$	-1	$+\infty$
$x+1$	-	0	+
x^2+4	+	+	+
$\frac{x+1}{x^2+4}$	-	+	+

$$-1 \leq x < \infty$$

Yanıt / Answer A

5. $(x+3)(2-x) > 0 \Rightarrow ? < x < ?$

- A) $-3 < x < 2$ B) $-2 < x < 3$ C) $-1 < x < 4$
D) $0 < x < 5$ E) $1 < x < 6$

Çözüm / Solution:

$$(x+3) \cdot (2-x) > 0$$

$$x+3=0 \Rightarrow x=-3$$

$$2-x=0 \Rightarrow x=2$$

x	$-\infty$	-3	2	$+\infty$
x+3	-	0	+	+
2-x	+	+	0	-
$(x+3) \cdot (2-x)$	-	+	-	-

$$-3 < x < 2$$

Yanıt / Answer A

6. $x^2 - 6x + 5 > 0 \Rightarrow ? < x < ?$

- A) $(-\infty, -2) \cup (3, \infty)$
 B) $(-\infty, 1) \cup (3, \infty)$
 C) $(-\infty, -2) \cup (6, \infty)$
 D) $(-\infty, 1) \cup (5, \infty)$
 E) $(-\infty, -1) \cup (4, \infty)$

Çözüm / Solution:

$$x^2 - 6x + 5 > 0$$

$$x^2 - 6x + 5 = 0$$

$$(x-5) \cdot (x-1) = 0$$

$$x-5=0 \text{ veya (or) } x-1=0$$

$$x=5 \quad // \quad x=1$$

x	$-\infty$	1	5	$+\infty$
$x^2 - 6x + 5$	+	0	-	+

$$S \cdot S = \{x \mid -\infty < x < 1 \text{ veya (or) } 5 < x < \infty, x \in \mathbb{R}\}$$

$$= (-\infty, -1) \cup (5, \infty)$$

Yanıt / Answer D

7. $\frac{-x^2 + 3x + 4}{x^2 + 5} > 0 \Rightarrow ? < x < ?$

- A) $-5 < x < 1$ B) $-4 < x < 2$ C) $-4 < x < 1$
 D) $-1 < x < 5$ E) $-1 < x < 4$

Çözüm / Solution:

$$-x^2 + 3x + 4 = 0$$

$$(-x+4)(x+1) = 0$$

$$-x+4=0 \text{ veya (or) } x+1=0$$

$$x=4 \quad // \quad x=-1$$

$$x^2 + 5 = 0 \quad x \notin \mathbb{R}$$

x	$-\infty$	-1	4	$+\infty$
$-x^2 + 3x + 4$	-	0	+	-
$x^2 + 5$	+	+	+	+
$\frac{-x^2 + 3x + 4}{x^2 + 5}$	-	+	-	-

$$-1 < x < 4$$

$$\frac{-x^2 + 3x + 4}{x^2 + 5} > 0$$

Yanıt / Answer E

8. $x^2 - 3x + 2 > 0 \Rightarrow ? < x < ?$

- A) $(-\infty, -1) \cup (2, \infty)$ B) $(-\infty, 1) \cup (3, \infty)$
 C) $(-\infty, 1) \cup (2, \infty)$ D) $(-\infty, 2) \cup (3, \infty)$
 E) $(-\infty, -2) \cup (3, \infty)$

Çözüm / Solution:

$$x^2 - 3x + 2 > 0$$

$$x^2 - 3x + 2 = 0$$

$$(x-2)(x-1) = 0$$

$$x-2=0 \text{ veya (or) } x-1=0$$

$$x=2 \quad // \quad x=1$$

x	$-\infty$	1	2	$+\infty$
$x^2 - 3x + 2$	+	0	-	+

$$\text{ÇK(SS)} = \{x \mid -\infty < x < 1 \text{ veya (or) } 2 < x < \infty, x \in \mathbb{R}\}$$

$$= (-\infty, 1) \cup (2, \infty)$$

Yanıt / Answer C

9. $x^2 - 9 < 0 \Rightarrow \text{ÇK(SS)} = ?$

- A) $(-9, 9)$ B) $(-3, 3)$ C) $(-3, 4)$
 D) $(-4, 3)$ E) $(3, 9)$

Çözüm / Solution:

$$x^2 - 9 < 0, \quad x^2 - 9 = 0$$

$$(x-3)(x+3) = 0$$

$$x-3=0 \quad \text{veya (or)} \quad x+3=0$$

$$x=3 \quad // \quad x=-3$$

x	$-\infty$	-3	3	$+\infty$	
$x^2 - 9$	+	0	-	0	+

$$\text{ÇK(SS)} = \{x \mid -3 < x < 3, x \in \mathbb{R}\}$$

$$= (-3, 3)$$

Yanıt / Answer B

10. $3x-1 < x^2-x+2 \Rightarrow \text{ÇK(SS)} = ?$

- A) $(-\infty, -1) \cup (3, \infty)$ B) $(-\infty, 1) \cup (3, \infty)$
 C) $(-\infty, 1) \cup (4, \infty)$ D) $(-\infty, -1) \cup (4, \infty)$
 E) $(-\infty, -2) \cup (5, \infty)$

Çözüm / Solution:

$$3x-1 < x^2-x+2$$

$$0 < x^2-4x+3$$

$$x^2-4x+3 = 0$$

$$x-3=0 \quad \text{veya (or)} \quad x-1=0$$

$$x=3 \quad // \quad x=1$$

x	$-\infty$	-3	3	$+\infty$	
x^2-9	+	0	-	0	+

$$\text{ÇK(SS)} = \{x \mid \infty < x < 1 \text{ veya (or) } 3 < x < \infty, x \in \mathbb{R}\}$$

$$= (-\infty, 1) \cup (3, \infty)$$

Yanıt / Answer B

11. $(x^2-1) \cdot (x+4) > 0 \Rightarrow \text{ÇK(SS)} = ?$

- A) $(-4, -2) \cup (2, \infty)$
 B) $(-4, -1) \cup (1, \infty)$
 C) $(-4, 1) \cup (2, \infty)$
 D) $(-2, 1) \cup (2, \infty)$
 E) $(-1, 4) \cup (5, \infty)$

Çözüm / Solution:

$$(x^2-1) \cdot (x+4) > 0$$

$$x^2-1 = 0$$

$$(x-1) \cdot (x+1) = 0$$

$$x-1=0 \quad \text{veya (or)} \quad x+1=0$$

$$x=1 \quad // \quad x=-1$$

$$x+4=0$$

$$x=-4$$

x	$-\infty$	-4	-1	1	$+\infty$	
$x^2 - 1$	+	+	0	-	0	+
$x + 4$	-	0	+	+	+	+
$(x^2 - 1)(x + 4)$	-	-	+	-	+	+

$$\text{ÇK(SS)} = \{x \mid -4 < x < -1 \vee 1 < x < \infty, x \in \mathbb{R}\}$$

$$= (-4, -1) \cup (1, \infty)$$

Yanıt / Answer B

12. $\frac{x+1}{x-1} - \frac{x+3}{x-2} > 0 \Rightarrow \text{ÇK(SS)} = ?$

- A) $(-\infty, \frac{1}{3}) \cup (1, 2)$ B) $(-\infty, -1) \cup (1, 2)$
 C) $(-\infty, 0) \cup (2, 4)$ D) $(-\infty, -3) \cup (1, 5)$
 E) $(-\infty, \frac{2}{3}) \cup (\frac{1}{2}, 3)$

Çözüm / Solution:

$$\frac{x+1}{x-1} - \frac{x+3}{x-2} > 0$$

$$\frac{(x+1)(x-2) - (x+3)(x-1)}{(x-1) \cdot (x-2)}$$

$$\frac{x^2-2x+x-2-x^2+x-3x+3}{(x-1) \cdot (x-2)} > 0$$

$$\frac{-3x+1}{(x-1) \cdot (x-2)} > 0$$

$$-3x+1=0 \Rightarrow x = \frac{1}{3}$$

$$x-1=0 \Rightarrow x=1, x-2=0 \Rightarrow x=2$$

x	$-\infty$	$\frac{1}{3}$	1	2	$+\infty$
$-3x+1$	+	0	-	-	-
$x-1$	-	-	0	+	+
$x-2$	-	-	-	0	+
$-3x+1$	+	-	-	+	-
$(x-1)(x-2)$	+	-	-	+	-

$$\text{ÇK (SS)} = \{x \mid -\infty < x < \frac{1}{3} \vee 1 < x < 2, x \in \mathbb{R}\}$$

$$= (-\infty, \frac{1}{3}) \cup (1, 2)$$

Yanıt / Answer A

$$13. x^2 - x + 4 > 0 \quad ? < x < ?$$

- A) $-\infty < x < 0$ B) $-\infty < x < \infty$ C) $0 < x < \infty$
D) $-\infty < x < -4$ E) $-\infty < x < 4$

Çözüm / Solution:

$$x^2 - x + 4 > 0$$

$$x^2 - x + 4 = 0$$

$$\Delta = b^2 - 4 \cdot a \cdot c$$

$$\Delta = (-1)^2 - 4 \cdot 1 \cdot 4$$

$$\Delta = 1 - 16$$

$$\Delta = -15$$

$$x^2 - x + 4 = 0 \Rightarrow \text{ÇK (SS)} = \emptyset$$

x	$-\infty$		$+\infty$
$-x^2 - x + 4$	+	+	+

$$-\infty < x < \infty$$

Yanıt / Answer B

$$14. -x^2 + x - 5 > 0 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $-\infty < x < 0$ B) $\mathbb{R}$ C) $\emptyset$
D) $0 < x < \infty$ E) $-\infty < x < -1$

Çözüm / Solution:

$$-x^2 + x - 5 > 0$$

$$-x^2 + x - 5 = 0$$

$$\Delta = 1^2 - 4 \cdot (-1) \cdot (-5)$$

$$\Delta = 1 - 20$$

$$\Delta = -19, -x^2 + x - 5 = 0 \Rightarrow \text{ÇK (SS)} = \emptyset$$

x	$-\infty$		$+\infty$
$-x^2 + x - 5$	-	-	-

Yanıt / Answer C

$$15. a < x < b, x^2 - x < 6 \Rightarrow (a, b) = ?$$

- A) $(-3, 4)$ B) $(-2, 1)$ C) $(-2, -1)$
D) $(-2, 3)$ E) $(3, 5)$

Çözüm / Solution:

$$x^2 - x < 6$$

$$x^2 - x - 6 < 0$$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0$$

$$x-3=0 \quad \text{veya (or)} \quad x+2=0$$

$$x=3 \quad \quad \quad x=-2$$

x	$-\infty$	-2	3	$+\infty$
$x^2 - x - 6$	+	0	0	+
		$-2 < x < 3$	$(a, b) = (-2, 3)$	

Yanıt / Answer D

$$16. a \leq x \leq b, 8 \geq x^2 + 2x \Rightarrow [a, b] = ?$$

- A) $[1, 4]$ B) $[1, 2]$ C) $[-4, -1]$
D) $[-1, 2]$ E) $[-4, 2]$

Çözüm / Solution:

$$8 \geq x^2 + 2x$$

$$0 \geq x^2 + 2x - 8$$

$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$x+4=0 \quad \text{veya (or)} \quad x-2=0$$

$$x-2=0$$

$$x=-4$$

$$x=2$$

x	$-\infty$	-4	2	$+\infty$
$x^2 + 2x - 8$	+	0	0	+
		$-4 \leq x \leq 2$		

$$[a, b] = [-4, 2]$$

Yanıt - Answer E

17. $\frac{x^2-3x-10}{x^2+2x+4} < 0 \Rightarrow ? < x < ?$

- A) $2 < x < 4$ B) $0 < x < 6$ C) $-1 < x < 5$
D) $-2 < x < 5$ E) $-3 < x < 4$

Çözüm / Solution:

$$\frac{x^2-3x-10}{x^2+2x+4} < 0$$

$$x^2-3x-10=0, \quad (x-5)(x+2)=0$$

$$x=5 \quad \text{veya (or)} \quad x=-2$$

$$x^2+2x+4=0, \quad \Delta=2^2-4 \cdot 1 \cdot 4$$

$$\Delta=-12, \quad x^2+2x+4=0 \Rightarrow S \cap S = \emptyset$$

x	$-\infty$	-2	5	$+\infty$	
$x^2-3x-10$	+	0	-	0	+
x^2+2x+4	+		+		+
$\frac{x^2-3x-10}{x^2+2x+4}$	+		-		+

$-2 < x < 5$

Yanıt / Answer D

18. $\frac{(x^2+1)(2-x)}{x^2-4x+4} < 0 \Rightarrow ? < x < ?$

- A) $5 < x < \infty$ B) $4 < x < \infty$ C) $2 < x < \infty$
D) $1 < x < \infty$ E) $0 < x < \infty$

Çözüm / Solution:

$$x^2+1=0 \Rightarrow x \notin \mathbb{R}$$

$$2-x=0 \Rightarrow x=2$$

$$x^2-4x+4=0 \Rightarrow (x-2)^2=0 \Rightarrow x=2$$

x	$-\infty$	2	$+\infty$
x^2+1	+		+
$2-x$	+	0	-
x^2-4x+4	+	0	+
$\frac{(x^2+1)(2-x)}{x^2-4x+4}$	+		-

$2 < x < \infty$

Yanıt / Answer C

19. $\frac{(x-1)^2}{x^2-6x+5} < 0, x \in \mathbb{Z} \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{1, 2, 3, 4\}$ B) $\{2, 3, 4\}$ C) $\{2, 3, 4, 5\}$
D) $\{-1, 1, 2, 3\}$ E) $\{-2, -1, 0\}$

Çözüm / Solution:

$$(x-1)^2=0 \Rightarrow x=1$$

$$x^2-6x+5=0$$

$$(x-5)(x-1)=0$$

$$x=5 \quad \text{veya (or)} \quad x=1$$

x	$-\infty$	1	$+\infty$
$(x-1)^2$	+	0	+
x^2-6x+5	+	0	+
$\frac{(x-1)^2}{x^2-6x+5}$	+	-	+

$$1 < x < 5, x \in \mathbb{Z} \Rightarrow \text{ÇK (SS)} = \{2, 3, 4\}$$

Yanıt / Answer B

20. $\frac{x^2-8x+7}{(x+2)^2} < 0, x \in \mathbb{Z} \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{2, 3, 4, 5, 6\}$ B) $\{3, 4, 5, 6, 7, 8\}$
C) $\{-12, 0, 1, 2, 3\}$ D) $\{1, 2, 3, 4, 5\}$
E) $\{5, 6, 7, 8\}$

Çözüm (Solution) :

$$x^2-8x+7=0$$

$$(x-7)(x-1)=0 \Rightarrow x=7 \quad \text{veya (or)} \quad x=1$$

$$(x+2)^2=0 \Rightarrow x+2=0 \Rightarrow x=-2$$

x	$-\infty$	-2	1	7	$+\infty$		
$x^2 - 8x + 7$	+		+	0	-	0	+
$(x + 2)^2$	+	0	+		+		+
$\frac{x^2 - 8x + 7}{(x + 2)^2}$	+		+		-		+

$$1 < x < 7, x \in \mathbb{Z} \Rightarrow \text{ÇK (SS)} = \{2, 3, 4, 5, 6\}$$

Yanıt / Answer A

İKİNCİ DERECE FONKSİYONLARIN GRAFİĞİ GRAPH of SECOND ORDER FUNCTION

Parabol: $a, b, c \in \mathbb{R}$ ve $a \neq 0$ olmak üzere,

$y = f(x) = ax^2 + bx + c$ şeklindeki ikinci dereceden fonksiyonların grafiğine **parabol** denir.

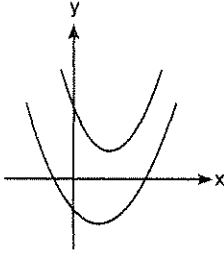
Parabola: Provided that $a, b, c \in \mathbb{R}$ and $a \neq 0$, the graph of the second order equation $y = f(x) = ax^2 + bx + c$ is called a parabola.

$y = f(x) = ax^2 + bx + c$ fonksiyonlarının grafiği çizilirken aşağıdaki sıra izlenir:

To draw the graph of a second order function, follow the steps below:

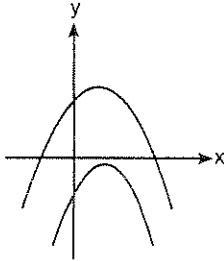
1. i. $a > 0$ ise grafiğin kolları yukarı doğrudur.

If $a > 0$, then the curve is concave upward.



- ii. $a < 0$ ise grafiğin kolları aşağı doğrudur.

If $a < 0$, then the curve is concave downward.

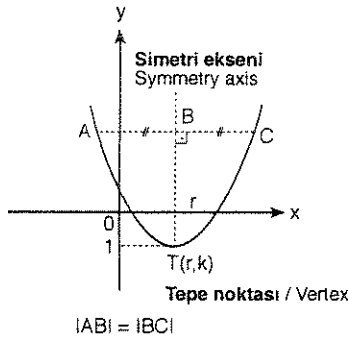


2. Tepe Noktası / The vertex

$$(r, k) = \left(-\frac{b}{2a}, \frac{4ac - b^2}{4a} \right)$$

$$y = f(x) = a \cdot (x - r)^2 + k \Rightarrow (a \in \mathbb{R})$$

Tepe noktası (r, k) dir. / The vertex is (r, k) .



Örnek / Example:

$y = 3x^2$ fonksiyonunun grafiğini çiziniz. / Draw the graph.

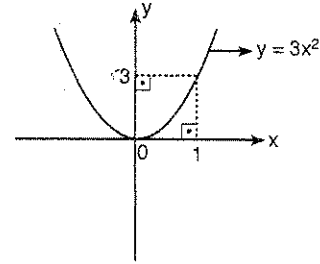
Çözüm / Solution:

$$y = 3x^2 \Rightarrow a = 3, b = 0, c = 0$$

$$\text{Tepe noktası: } \left(-\frac{b}{2a}, \frac{4ac - b^2}{4a} \right) = \left(-\frac{0}{2 \cdot 3}, \frac{4 \cdot 3 \cdot 0 - 0^2}{4 \cdot 3} \right)$$

$$(\text{Peak point}) = (0, 0)$$

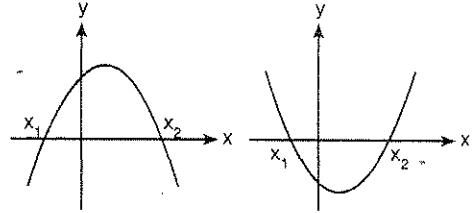
$a > 0$



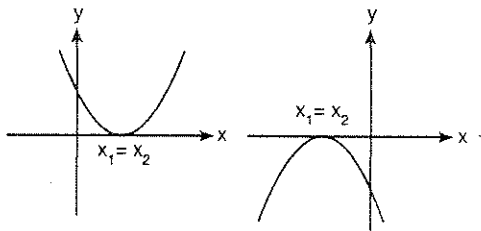
www.douknowturkey.com

3. $y = f(x) = ax^2 + bx + c = 0$

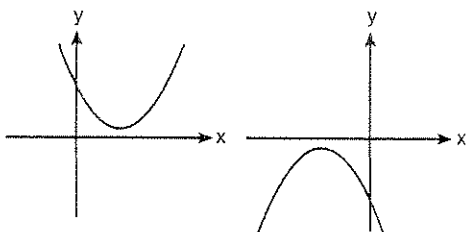
- i. $\Delta > 0$



- ii. $\Delta = 0$



- iii. $\Delta < 0$





Eksenleri kestiği noktalar ile bir noktası bilinen parabolün denkleminin bulunması

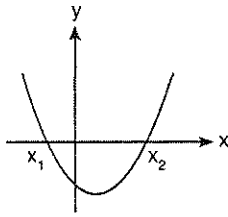
Finding the Equation of the Parabola with one point and the x and y intercepts which are given

Parabolün x eksenini kestiği noktalar biliniyorsa,

If the points of the parabola on which are intersected with x axis are certain,

- i. x eksenini $(x_1, 0)$, $(x_2, 0)$ noktalarında kesen parabolün denklemini.

The equation of the parabola with x - intercepts; $(x_1, 0)$ and $(x_2, 0)$,



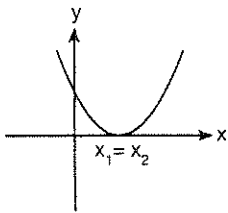
$$y = a(x_1 - x_2) \cdot (x - x_2)$$

- ii. a reel sayısını bulabilmek için bir yardımcı nokta verilir.

A point of the parabola is given to help to find the reel number a.

- iii. x eksenini $(x_1, 0) = (x_2, 0)$ noktasında teğet olan parabolün denklemini.

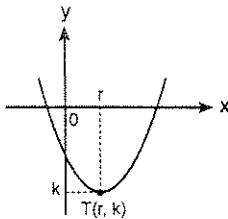
The equation of the parabola that is tangent to the x - axis at the point $(x_1, 0) = (x_2, 0)$.



$$f(x) = y = a \cdot (x - x_1)^2$$

- iii. Tepe noktası $T(r, k)$ olan parabolün denklemini.

The equation of the parabola with a vertex $T(r, k)$.



$$y = a(x - r)^2 + k$$

Örnek / Example:

$y = x^2 + 4x$ fonksiyonunun grafiğini çiziniz.

Draw the graph.

Çözüm / Solution:

$$y = x^2 + 4x \Rightarrow a = 1, b = 4, c = 0$$

$$r = -\frac{b}{2a} = -\frac{4}{2 \cdot 1} = -2$$

$$x = -2 \Rightarrow y = (-2)^2 + 4 \cdot (-2)$$

$$y = 4 - 8 = -4$$

Tepe noktası / Peak point $(-2, -4)$

$$x = 0 \Rightarrow y = 0^2 + 4 \cdot 0 = 0$$

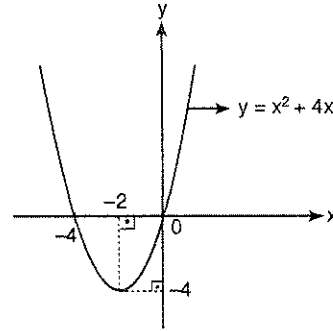
$$y = 0 \Rightarrow x^2 + 4x = 0$$

$$x(x + 4) = 0$$

$$x = 0 \text{ veya (or) } x + 4 = 0$$

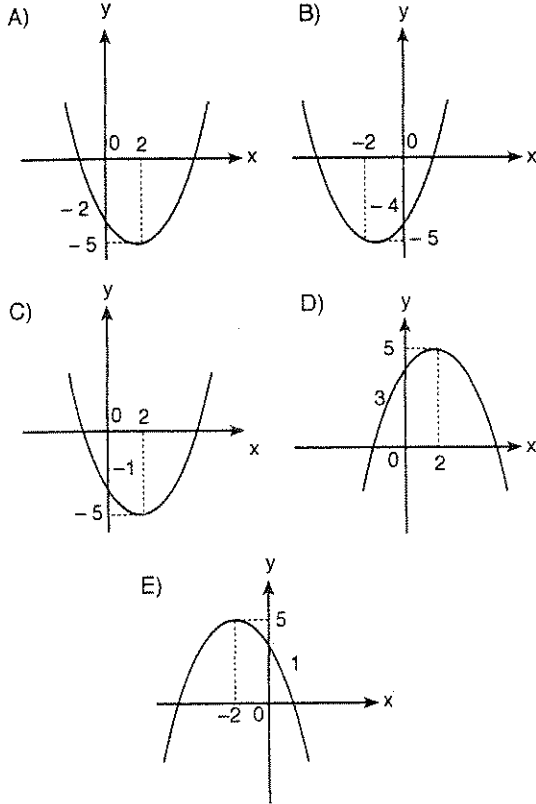
$$x = -4$$

$a > 0$



ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

1. $y = (x - 2)^2 - 5 \Rightarrow ?$



Çözüm / Solution:

$$y = f(x) = a \cdot (x - r)^2 + k \Rightarrow T = (r, k)$$

$$y = (x - 2)^2 - 5 \Rightarrow T = (2, -5)$$

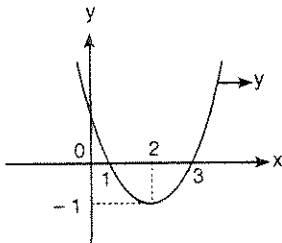
$$x = 0 \Rightarrow y = (0 - 2)^2 - 5$$

$$y = 4 - 5$$

$$y = -1$$

Yanıt / Answer C

2.



$\Rightarrow y = ?$

- A) $(x - 2)^2 - 1$ B) $(x + 2)^2 - 1$ C) $(x - 2)^2 - 4$
D) $(x - 2)^2 + 4$ E) $(x + 2)^2 + 1$

Çözüm / Solution:

$$T = (2, -1)$$

$$y = a \cdot (x - 2)^2 - 1$$

$$(1, 0) \in y \Rightarrow 0 = a \cdot (1 - 2)^2 - 1$$

$$0 = a - 1$$

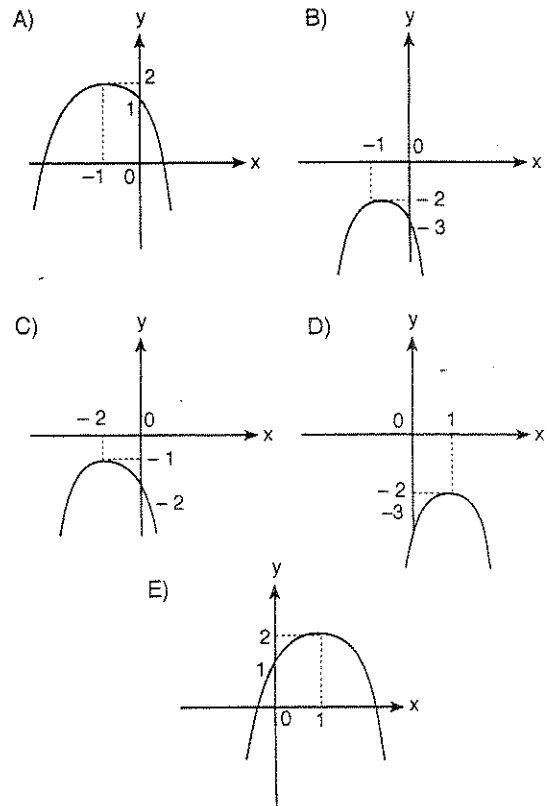
$$a = 1$$

$$y = 1 \cdot (x - 2)^2 - 1$$

$$y = (x - 2)^2 - 1$$

Yanıt / Answer A

3. $y = -(x + 1)^2 - 2 \Rightarrow ?$



Çözüm / Solution:

$$y = -(x + 1)^2 - 2 \Rightarrow T = (-1, -2)$$

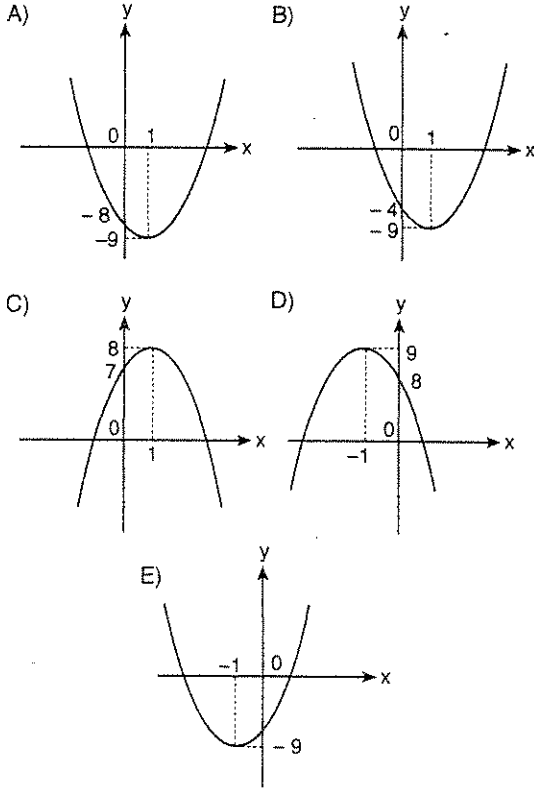
$$x = 0 \Rightarrow y = -(0 + 1)^2 - 2$$

$$y = -1 - 2$$

$$y = -3$$

Yanıt / Answer B

4. $y = x^2 - 2x - 8 \Rightarrow ?$



Çözüm / Solution:

$$y = ax^2 + bx + c \Rightarrow T = (r, k) = \left(-\frac{b}{2a}, \frac{4ac - b^2}{4a} \right)$$

$$y = x^2 - 2x - 8 \Rightarrow T = \left(-\frac{-2}{2 \cdot 1}, \frac{4 \cdot 1 \cdot (-8) - (-2)^2}{4 \cdot 1} \right)$$

$$T = \left(1, \frac{-32 - 4}{4} \right)$$

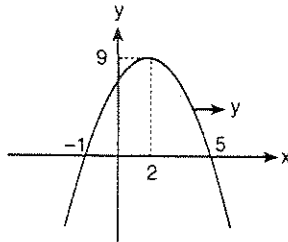
$$T = (1, -9)$$

$$x = 0 \Rightarrow y = 0^2 - 2 \cdot 0 - 8$$

$$y = -8$$

Yanıt / Answer A

5.



$$\Rightarrow y = ?$$

A) $(x+2)^2 - 5$ B) $(x-3)^2 - 9$ C) $(x-2)^2 + 9$

D) $-(x+2)^2 - 9$ E) $-(x-2)^2 + 9$

Çözüm / Solution:

$$T = (2, 9)$$

$$y = a \cdot (x-2)^2 + 9$$

$$(5, 0) \in y \Rightarrow 0 = a \cdot (5-2)^2 + 9$$

$$0 = a \cdot 9 + 9$$

$$-9 = a \cdot 9$$

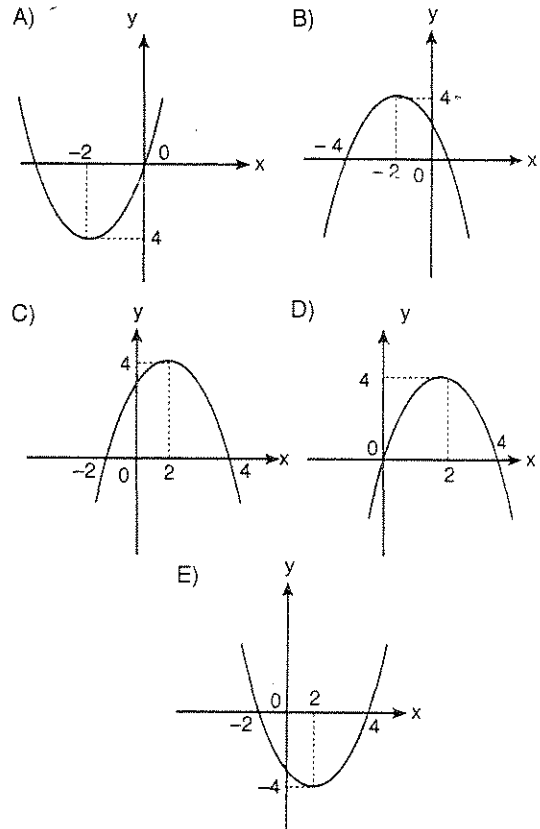
$$-1 = a$$

$$y = -1 \cdot (x-2)^2 + 9$$

$$y = -(x-2)^2 + 9$$

Yanıt / Answer E

6. $y = -x^2 + 4x \Rightarrow ?$



Çözüm / Solution:

$$y = -x^2 + 4x \quad a = -1, \quad b = 4, \quad c = 0$$

$$T = \left(\frac{-4}{2 \cdot (-1)}, \frac{4 \cdot (-1) \cdot 0 - 4^2}{4 \cdot (-1)} \right)$$

$$T = \left(2, \frac{-16}{-4} \right)$$

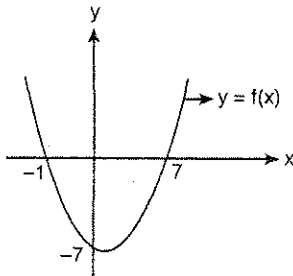
$$T = (2, 4)$$

$$x = 0 \Rightarrow y = -0^2 + 4 \cdot 0$$

$$y = 0$$

Yanıt / Answer D

7.



$$\Rightarrow y = f(x) = ?$$

- A) $x^2 - 6x + 7$ B) $x^2 - 6x - 7$ C) $x^2 + 6x - 7$
D) $x^2 - 4x - 7$ E) $x^2 + 4x - 7$

Çözüm / Solution:

$$y = a \cdot (x + 1) \cdot (x - 7)$$

$$(0, -7) \in y \Rightarrow -7 = a \cdot (0 + 1) \cdot (0 - 7)$$

$$-7 = a \cdot 1 \cdot (-7)$$

$$a = 1$$

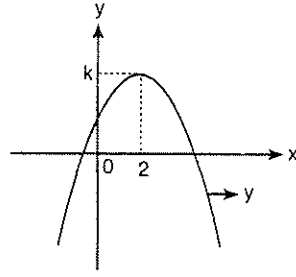
$$y = 1 \cdot (x + 1) \cdot (x - 7)$$

$$y = x^2 - 7x + x - 7$$

$$y = x^2 - 6x - 7$$

Yanıt / Answer B

8.



$$T(2, k), \quad y = (m + 1)x^2 - 2mx + 4 \Rightarrow m = ?$$

- A) -6 B) -4 C) -2 D) 2 E) 4

Çözüm / Solution:

$$T = (2, k)$$

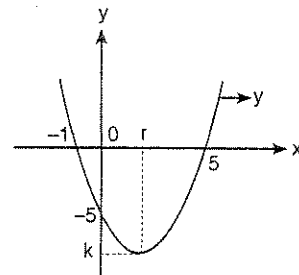
$$2 = \frac{-b}{2a}$$

$$2 = -\frac{2m}{2 \cdot (m + 1)}$$

$$2 = \frac{m}{m + 1} \Rightarrow 2m + 2 = m = -2$$

Yanıt / Answer C

9.



$$T(r, k) \Rightarrow k = ?$$

- A) -6 B) $-\frac{13}{2}$ C) -7 D) $-\frac{15}{2}$ E) -9

Çözüm / Solution:

$$y = a \cdot (x+1) \cdot (x-5)$$

$$(0, -5) \in y \Rightarrow -5 = a \cdot (0+1) \cdot (0-5)$$

$$-5 = a \cdot 1 \cdot (-5) \quad , \quad a = 1$$

$$y = 1 \cdot (x+1) \cdot (x-5) \quad , \quad y = x^2 - 5x + x - 5$$

$$y = x^2 - 4x - 5$$

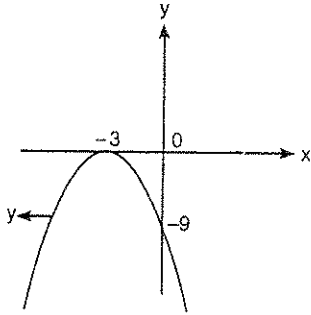
$$T = \left(-\frac{-4}{2}, \frac{4 \cdot 1 \cdot (-5) - (-4)^2}{4} \right)$$

$$T = \left(2, \frac{-20-16}{4} \right)$$

$$T = (2, -9) \Rightarrow k = -9$$

Yanıt / Answer E

10.



$$\Rightarrow y = ?$$

A) $-x^2 - 6x - 6$ B) $-x^2 - 9x - 3$ C) $-x^2 + 6x - 9$

D) $-x^2 - 6x - 9$ E) $-x^2 - 6x$

Çözüm / Solution:

$$y = a \cdot (x+3)^2$$

$$(0, -9) \in y \Rightarrow -9 = a \cdot (0+3)^2$$

$$-9 = a \cdot 9 \Rightarrow a = -1$$

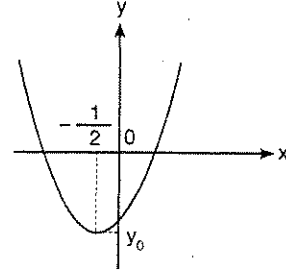
$$y = -1 \cdot (x+3)^2$$

$$y = -(x^2 + 6x + 9) \quad y = -x^2 - 6x - 9$$

Yanıt / Answer D

YÖS SORULARI / YÖS QUESTIONS

1.



$$T\left(-\frac{1}{2}, y_0\right), y = (m-1)x^2 + x - m \Rightarrow m = ?$$

A) 3 B) 2 C) 1 D) -1 E) -2

(YÖS 1992)

Çözüm / Solution:

$$T\left(-\frac{1}{2}, y_0\right) = \left(-\frac{b}{2a}, y_0\right)$$

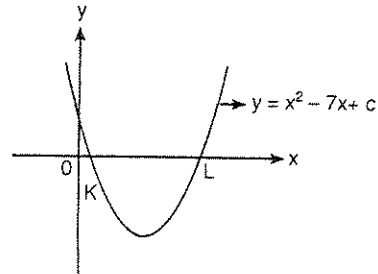
$$-\frac{1}{2} = -\frac{1}{2 \cdot (m-1)}$$

$$2(m-1) = 2$$

$$m-1 = 1 \Rightarrow m = 2$$

Yanıt / Answer B

2.



$$y = x^2 - 7x + c, |KL| = 5 \cdot |OK| \Rightarrow c = ?$$

A) 4 B) 5 C) 6 D) 7 E) 8

(YÖS 1997)

Çözüm / Solution:

$$K(x_1, 0), L(6x_1, 0)$$

$$x_1 + 6x_1 = -\frac{7}{1}$$

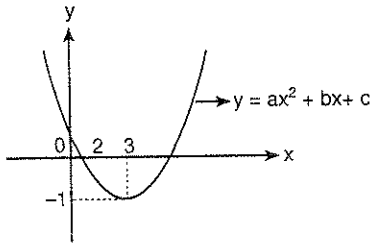
$$7x_1 = 7$$

$$x_1 = 1$$

$$0 = 1 - 7 + c \Rightarrow c = 6$$

Yanıt / Answer C

3.



$$y = ax^2 + bx + c \Rightarrow y = ?$$

$$A) x^2 - 6x + 8 \quad B) x^2 + 6x + 8 \quad C) x^2 + 6x - 8$$

$$D) 2x^2 - 6x + 8 \quad E) 2x^2 + 6x + 8$$

(YÖS 1998)

Çözüm / Solution:

$$y = a(x - r)^2 + k$$

$$T(3, -1) \Rightarrow r = 3$$

$$k = -1$$

$$y = a(x - 3)^2 - 1$$

$$(2, 0) \in y, 0 = a(2 - 3)^2 - 1$$

$$a = 1$$

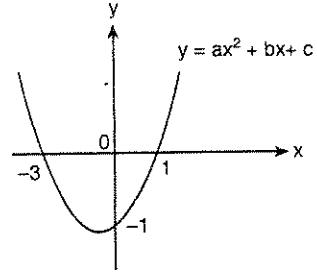
$$y = (x - 3)^2 - 1$$

$$= x^2 - 6x + 9 - 1$$

$$= x^2 - 6x + 8$$

Yanıt / Answer A

4.



$$\Rightarrow 3a + 6b + 2c = ?$$

$$A) 1 \quad B) 2 \quad C) 3 \quad D) 4 \quad E) 5$$

(YÖS 2001)

Çözüm / Solution:

Kesişim noktaları / Intersection points : $(-3, 1)$

$$y = a(x + 3)(x - 1), (0, -1) \Rightarrow -1 = a \cdot (3) \cdot (-1)$$

$$\Rightarrow a = \frac{1}{3}$$

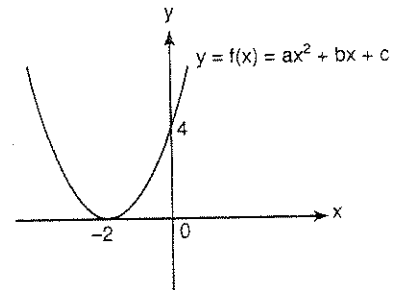
$$\Rightarrow y = \frac{1}{3}(x + 3)(x - 1) = \frac{x^2}{3} + \frac{2}{3}x - 1$$

$$\Rightarrow y = \frac{1}{3} \quad b = \frac{2}{3} \quad c = -1$$

$$\Rightarrow 3a + 6b + 2c = 3$$

Yanıt / Answer C

5.



$$\Rightarrow f(-3) = ?$$

$$A) -2 \quad B) -1 \quad C) 0 \quad D) 1 \quad E) 2$$

(YÖS 2002)

Çözüm / Solution:

Tepe noktasının koordinatları: $(-2, 0)$

Coordinates of peak point: r, k

$$y = a(x - r)^2 + k = a(x + 2)^2 + 0$$

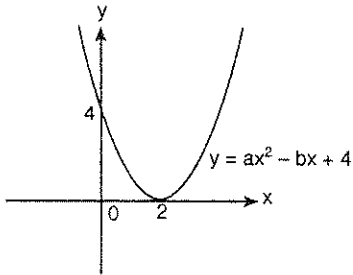
$$(0, 4) \Rightarrow 4 = a \cdot 4 \Rightarrow a = 1$$

$$\Rightarrow y = f(x) = (x + 2)^2$$

$$f(-3) = (-3 + 2)^2 = 1$$

Yanıt / Answer D

6.



$$\Rightarrow a + b = ?$$

- A) 4 B) 5 C) 6 D) 7 E) 8

(YÖS 2003)

Çözüm / Solution:

Tepe noktasının koordinatları $(r, k) = (2, 0)$

Coordinates of peak point

$$y = a(x - 2)^2 + 0$$

$$(0, 4) \Rightarrow 4 = a \cdot (0 - 2)^2 \Rightarrow 4 = 4a$$

$$a = 1$$

$$y = 1(x - 2)^2 = x^2 - 4x + 4 = a$$

$$x^2 - 4x + 4 = ax^2 + bx + 4$$

$$\Rightarrow a = 1 \text{ ve (and) } b = 4$$

$$a + b = 5$$

Yanıt / Answer B

1. $x^2 - 6x - 3 = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : $(3 \mp 2\sqrt{3})$

2. $x - \sqrt{2x+7} = 4 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : {9}

3. $3^{2x} - 2 \cdot 3^{x+1} - 27 = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : {2}

4. $m \in \mathbb{Z}^+$

$$f(x) = 2x^2 - (1 + 2m)x + m^2 - 4$$

$$f(x_1) = f(x_2) = 0$$

$$x_1 = 1 \Rightarrow x_2 = ?$$

Yanıt / Answer : $\frac{5}{2}$

5. $f(x) = x^2 - (2a - 1)x + a^2 - 1$

$$f(x_1) = f(x_2) = 0$$

$$x_1 = x_2 \Rightarrow a = ?$$

Yanıt / Answer : $\frac{5}{4}$

6. $f(x) = 5x^2 - 5x - 2 = 0$

$$f(x_1) = f(x_2) = 0$$

$$\Rightarrow (3x_1 - 2x_2) \cdot (3x_2 - 2x_1) = ?$$

Yanıt / Answer : -16

7. $x^3 - 3x^2 - 4x = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : {-1, 0, 4}

8. $2x^2 + x + 3 = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : $\emptyset$

9. $\left(x + \frac{3}{x}\right)^2 - 8 - \frac{6}{x} - 2x = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : {1, 3}

10. $x^6 - 26x^3 - 27 = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : {-1, 3}

11. $x^2 - 15x + K = 0, \frac{x_1}{x_2} = \frac{2}{3} \Rightarrow x_1 \cdot x_2 = ?$

Yanıt / Answer : 54

12. $x^2 - 6x + 4m = 0, x_1 = m \cdot x_2 \Rightarrow \sum m = ?$

Yanıt / Answer : -2

13. $x^2 < 12 - 4x \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : (-6, 2)

14. $-6x^2 + 51x - 105 \leq 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : $\left(\frac{7}{2}, 5\right)$

15.
$$\left. \begin{array}{l} \frac{3x}{(x+2)^2} > 0 \\ \frac{x(x-2)}{x+3} < 0 \end{array} \right\} \Rightarrow x \in ?$$

Yanıt / Answer : (0, 2)

16. $\frac{(x-2) \cdot (x+3)^2}{x^2 - 2x - 3} \leq 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : $(-\infty, -1) \cup [2, 3)$

$$17. \frac{(x^2 + 2x) \cdot (9 - x^2)}{x^2 - 2x + 1} \geq 0 \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $(-\infty, -3] \cup [-2, 0] \cup [1, \infty)$

$$18. \frac{(3-x)^2 \cdot (x^2 + 4x - 21)}{(16-x^2) \cdot (x^2 + 3x + 7)} \geq 0 \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $[-7, -4] \cup [3, 4)$

$$19. \left. \begin{array}{l} x^2 - 7x + 6 < 0 \\ x^2 - 8x + 15 \geq 0 \end{array} \right\} \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $(1, 3] \cup [5, 6)$

$$20. \frac{1}{x^2 - 2x - 15} > \frac{1}{x^2 - x - 2} \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $(-13, -3) \cup (-1, 2) \cup (5, +\infty)$

$$21. \frac{(x^2 - 2x - 8)(x-1)^5}{(x-2)^{10}} \leq 0 \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $[-2, 4]$

$$22. \begin{array}{l} x \in \mathbb{Z} \\ 4 \leq x^2 - 4x + 4 \leq 25 \end{array} \Rightarrow \sum x = ?$$

Yanıt / Answer : 16

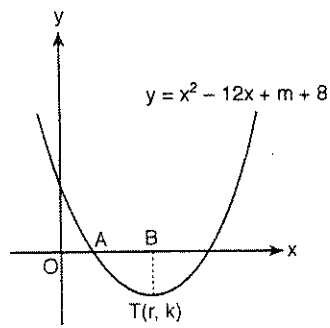
$$23. \frac{x}{x-2} - \frac{3}{x} > 2 \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $(-2, 0) \cup (2, 3)$

$$24. \frac{(x-2)(x^2 + 4x + 4)}{x^2 + 2x + 1} \leq 0 \Rightarrow \text{ÇK(SS)} = ?$$

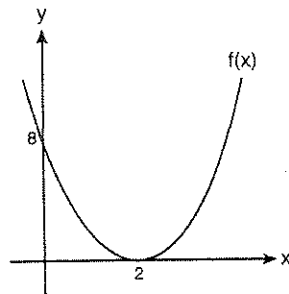
Yanıt / Answer : $(2, \infty) \cup \{2\}$

25. $|AB| = 2|AO|$
 $\Rightarrow m = ?$



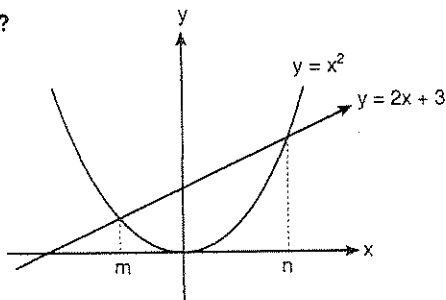
Yanıt / Answer : 12

26. $f(x) = (x - 2) \cdot (2x + b)$
 $\Rightarrow a + b = ?$



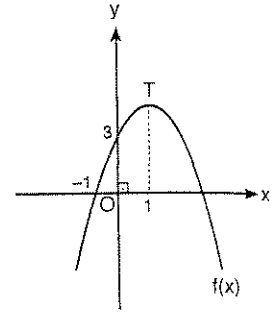
Yanıt / Answer : -2

27. $\Rightarrow m \cdot n = ?$



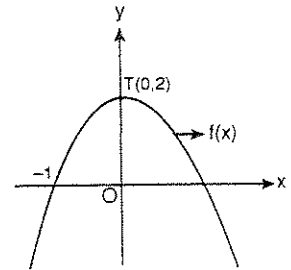
Yanıt / Answer : -3

28. $f(x) = ax^2 + bx + c$
 $\Rightarrow a - b + c = ?$



Yanıt / Answer : 0

29. $T(0, 2) \Rightarrow f(3) = ?$



Yanıt / Answer : -16

30. $f(x) = -x^2 + 6x + 5$
 $\Rightarrow \max(f(x)) = ?$

Yanıt / Answer : 14

1. $(2x - 4)^2 = (3x + 2)^2 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{3, 6\}$ B) $\left\{\frac{2}{5}, -6\right\}$ C) $\left\{\frac{3}{5}, \frac{6}{5}\right\}$
 D) $\left\{-3, \frac{6}{5}\right\}$ E) $\left\{-\frac{2}{3}, 3\right\}$

2. $(x + 4) \cdot (x - 3) - 2 \cdot (x - 2) \cdot (x + 3) + x + 1 = 0$
 $\Rightarrow \text{ÇK (SS)} = ?$

- A) $\{2, 3\}$ B) $\{1, 3\}$ C) $\{-1, 1\}$
 D) $\{-1, -3\}$ E) $\{-2, 3\}$

3. $x^2 + 4x - 2m = 0$ $\text{ÇK(SS)} = \{2, n\} \Rightarrow n = ?$
 A) -6 B) -4 C) 4 D) 6 E) 8

4. $x^2 - 2x + 6 + m = 0$

$x_1 = x_2 \Rightarrow m = ?$

- A) -7 B) -5 C) 1 D) 3 E) 5

5. $x^2 - (m + 3)x + m + 2 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{2, m + 2\}$ B) $\{1, m + 2\}$ C) $\left\{\frac{m}{2}, \frac{m}{3}\right\}$
 D) $\{1 + m, -2\}$ E) $\left\{\frac{2m}{3}, \frac{m}{2}\right\}$

6. $\frac{x+2}{x-2} + x + 2 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\left\{-\frac{5}{2}, 1\right\}$ B) $\{-2, 1\}$ C) $\left\{\frac{1}{2}, 5\right\}$
 D) $\left\{\frac{4}{3}, 5\right\}$ E) $\{-2, 4\}$

7. $\left(\frac{2x+1}{x}\right)^2 + 2 \cdot \left(\frac{2x+1}{x}\right) - 3 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{-1, -\frac{1}{5}\}$ B) $\{-3, 4\}$ C) $\left\{-\frac{1}{2}, 1\right\}$
 D) $\left\{\frac{1}{5}, 3\right\}$ E) $\{-1, 4\}$

8. $(x + 3)^4 + 2 \cdot (x + 3)^2 - 3 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{-1, 4\}$ B) $\{-4, 2\}$ C) $\{-2, 4\}$
 D) $\{-4, -2\}$ E) $\{-4, -1\}$

9. $\sqrt{2 - \sqrt{3x}} = 1 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{1\}$ B) $\left\{\frac{1}{2}\right\}$ C) $\left\{\frac{1}{3}\right\}$ D) $\left\{\frac{2}{3}\right\}$ E) $\{0\}$

10. $\sqrt{x-1} + \frac{1}{\sqrt{x-1}} = 2 \Rightarrow x_1 + x_2 = ?$

- A) 3 B) 4 C) 5 D) 6 E) 7

11. $x^2 + mx + n = 0$, $\text{ÇK}(SS) = \{m, n\} \Rightarrow m + n = ?$

- A) -2 B) -1 C) $-\frac{1}{2}$ D) $\frac{3}{2}$ E) 3

12. $x^2 - 3x - 2 = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$

$\Rightarrow \frac{2}{x_1 + 2} + \frac{2}{x_2 + 2} = ?$

- A) $\frac{4}{7}$ B) $\frac{5}{3}$ C) $\frac{7}{4}$ D) 2 E) 16

13. $x^2 + 2x - m = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$ ve (and)

$x_1 \cdot x_2 - 2x_1 - 2x_2 = 3 \Rightarrow m = ?$

- A) 1 B) 3 C) 5 D) 7 E) 9

14. $x^2 - (2 - m)x - m + 3 = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$

$x_1 \cdot (2x_2 - 1) + x_2 (2x_1 - 1) = 1 \Rightarrow m = ?$

- A) 9 B) 8 C) 6 D) 5 E) 3

15. $x^2 + 5x + a = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$

$3x_1 - x_2 = 1 \Rightarrow a = ?$

- A) 2 B) 4 C) 6 D) 7 E) 9

16. $x^2 - 2x + a = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$

$x_1^2 + x_2^2 = 20 \Rightarrow a = ?$

- A) -8 B) -2 C) 5 D) 7 E) 8

17. $x^2 - 2mx + 8 = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$

$x_1 = 2 \cdot x_2 \Rightarrow m = ?$

- A) 2 B) 3 C) 5 D) 7 E) 9

18. $a < 0$

$x^2 + (2a - 1)x - 8 = 0$, $\text{ÇK}(SS) = \{x_1, x_2\}$,

$x_1^2 + x_2^2 = 65 \Rightarrow a = ?$

- A) -5 B) -3 C) -1 D) 0 E) 4

19. $x^2 - 4x + a = 0$, $\text{ÇK} = \{x_1, x_2\}$

Çözüm kümesi $\text{Ç} = \{x_1 - 1, x_2 - 1\}$ olan ikinci dere-
ce denklemler aşağıdakilerden hangisidir?

What is the equation having the following solution set?

$SS = \{x_1 - 1, x_2 - 1\}$

- A) $x^2 - ax + 4 = 0$ B) $x^2 + 2x + a - 3 = 0$
C) $x^2 - 2x + a - 3 = 0$ D) $x^2 - 2x + a = 0$
E) $x^2 - 4x + a - 4 = 0$

20. $x^2 + 3ax - 10 = 0$, $\text{ÇK}(SS) = \{1, n\} \Rightarrow n = ?$

- A) 10 B) 9 C) -7 D) -9 E) -10

Yanıtlar / Answers

1. B	2. C	3. A	4. B	5. B	6. B
7. A	8. D	9. C	10. B	11. B	12. C
13. A	14. E	15. B	16. A	17. B	18. B
19. C	20. E				

1. $9^x - 4 \cdot 3^{x+1} + 27 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) {1, 2} B) {3, 9} C) {2, 4}
D) {0, 1} E) {0, 3}

2. $(3x - 4)^2 - 7(3x - 4) + 10 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) {-1, 3} B) {-4, 1} C) {2, 3}
D) {3, 5} E) {2, 5}

3. $x^4 - 5x^2 - 36 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) {-2, -1, 2} B) {-3, -1, 3} C) {-2, 2}
D) {-3, 3} E) {-3, 2, -2, 3}

4. $x - 4\sqrt{x+1} + 4 = 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) {1, 4} B) {0, 6} C) {8, 9}
D) {0, 8} E) {-2, 0}

5. $(2m - 3)x^2 - 2(2m + 1)x + (2m + 21) = 0$

$x_1 = x_2 \Rightarrow m = ?$

- A) 2 B) 4 C) 6 D) 8 E) 12

6. $x^2 - 4(m + 1)x + 3m - 6 = 0, x_1 = 2 \Rightarrow m = ?$

- A) 8 B) 6 C) 2 D) -2 E) 4

7. $(m - 1)x^2 + mx + 3 - 4m = 0, x_1 = -3 \Rightarrow x_2 = ?$

- A) 8 B) 3 C) $\frac{12}{15}$ D) $\frac{3}{2}$ E) $\frac{4}{3}$

8. $3x^2 - 10x + 2 = 0 \Rightarrow x_1^{-1} + x_2^{-1} = ?$

- A) 4 B) 5 C) $\frac{5}{2}$ D) $\frac{1}{5}$ E) $\frac{1}{10}$

9. $2x^2 - (m - 3)x - 2m + 10 = 0, x_1 + x_2 = 3$

$\Rightarrow m = ?$

- A) 4 B) 5 C) 7 D) 8 E) 9

10. $x^2 + (m + 2)x + (m - 4) = 0$

$2x_1 + 2x_2 + 3x_1 x_2 = 5 \Rightarrow m = ?$

- A) 8 B) 11 C) 15 D) 21 E) 28

11. $x^2 - 6x + m - 3 = 0$, $x_1 = 2x_2 \Rightarrow m = ?$

- A) 6 B) 7 C) 8 D) 10 E) 11

12. $\sqrt{x-3} - \sqrt[4]{x-3} = 2 \Rightarrow x = ?$

- A) 15 B) 17 C) 18 D) 19 E) 23

13. $(x^3 - 26x^{\frac{3}{2}} - 27) \cdot (x^3 + 1) = 0 \Rightarrow \text{ÇK (SS)} = ?$
 A) $\{1, -1\}$ B) $\{-1, 9\}$ C) $\{-1, +\sqrt{3}\}$
 D) $\{-1, \mp\sqrt{3}\}$ E) $\{-1, -\sqrt{3}\}$

14. $3x^2 + ax - 12 = 0$, $\frac{3}{x_1} - \frac{x_2 - 3}{x_2} = 1 \Rightarrow a = ?$
 A) 5 B) 6 C) 8 D) 10 E) 12

15. $\frac{2ax^2 - 3ax + b^2}{ax} = 1 \Rightarrow x_1 + x_2 = ?$
 A) $3a$ B) $\frac{3}{2}$ C) $4a$ D) 4 E) 2

16. $x^2 - (2x_1 - 3)x + 4x_2 = 0 \Rightarrow x_1 + x_2 = ?$
 A) 4 B) 5 C) 7 D) 8 E) 11

17. $x^2 + (a-3)x + a + 2 = 0$, $\frac{x_1}{x_2} + \frac{x_2}{x_1} = -2$

$\Rightarrow x_1 \cdot x_2 = ?$

- A) 4 B) 5 C) 8 D) 10 E) 12

18. $x^2 - (m-3)x - 8 = 0$, $x_1 = x_2^2 \Rightarrow m = ?$

- A) 2 B) 3 C) 4 D) 5 E) 7

19. $x^2 - (2m-1)x + 3 = 0$, $\frac{1}{x_1} + x_2 = 2$

$\Rightarrow x_1 + x_2 = ?$

- A) $\frac{3}{2}$ B) 2 C) $\frac{5}{2}$ D) 4 E) $\frac{7}{2}$

20. $x^2 - 5x + K = 0$, $x_1 - 2x_2 = 2 \Rightarrow K = ?$

- A) -3 B) $-\frac{4}{3}$ C) 1 D) 3 E) 4

Yanıtlar / Answers

1. A	2. C	3. D	4. D	5. A	6. D
7. D	8. B	9. E	10. D	11. E	12. D
13. B	14. C	15. E	16. B	17. B	18. D
19. E	20. E				

1. $x^2 - 3x + m + 1 = 0$
 $x_1 x_2^2 + x_1^2 x_2 - 15 = 0 \Rightarrow 5 \cdot (x_1^{-1} + x_2^{-1}) = ?$
 A) 15 B) 10 C) 9 D) 5 E) 3

2. $x_1 = -2, x_2 = 5 \Rightarrow x^2 - Sx + P = ?$
 A) $x^2 - 10x + 3 = 0$
 B) $x^2 - 7x + 5 = 0$
 C) $x^2 - 3x - 10 = 0$
 D) $x^2 + 3x + 10 = 0$
 E) $x^2 - 2x + 5 = 0$

3. $x^3 - \frac{2}{x-5} = 64 + \frac{2}{5-x} \Rightarrow x = ?$
 A) -4 B) -2 C) 3 D) 4 E) 8

4. $ax^2 + bx + c = 0, x_1 = 2 - \sqrt{3} \Rightarrow \frac{x_1 + x_2}{x_1 \cdot x_2} = ?$
 A) 1 B) $2\sqrt{3}$ C) 2 D) 4 E) $4 + \sqrt{3}$

5. $x^{8-3m} + mx + 4m - 1 = 0 = ax^2 + bx + c$
 $\Rightarrow x_1 \cdot x_2 = ?$
 A) 6 B) 7 C) 8 D) 10 E) 14

6. $mx^2 - 5x + 2m - 2 = 0, x_1 = x_2^{-1}$
 $\Rightarrow \frac{8}{13} (x_1^3 + x_2^3) = ?$
 A) 3 B) 4 C) 5 D) 7 E) 9

7. $2x^2 - x + p^2 + q^2 = 0, x_1 = p, x_2 = q$
 $\Rightarrow \frac{p^2 + q^2}{p \cdot q} = ?$
 A) 2 B) 3 C) 4 D) 5 E) 6

8. $x^2 - 5x + m = 0, x_2 = x_1 + 1 \Rightarrow m = ?$
 A) -6 B) -4 C) 0 D) 3 E) 6

9. $(m-1)x^2 - mx + 1 = 0 = (ax+b)^2 \Rightarrow m = ?$
 A) 1 B) 2 C) 3 D) 4 E) 5

10. $ax^2 + (2a-1)x + (a+2) = 0$
 $x_1, x_2 \in \mathbb{R} \Rightarrow a = ?$
 A) $a > \frac{1}{3}$ B) $a < \frac{1}{12}$ C) $a < \frac{1}{4}$
 D) $a > \frac{3}{5}$ E) $a < \frac{1}{5}$

$$11. \frac{x+2}{x-2} - \frac{2}{x+2} - \frac{3}{x-2} = \frac{7}{6} \Rightarrow x = ?$$

- A) -8 B) $\frac{1}{2}$ C) $\frac{4}{3}$ D) 4 E) $-\frac{5}{2}$

$$12. \left(\frac{2x+1}{x}\right)^2 + 2\left(\frac{2x+1}{x}\right) - 3 = 0 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\left\{-\frac{1}{5}, -1\right\}$ B) $\left\{\frac{1}{5}, 3\right\}$ C) $\left\{-\frac{1}{2}\right\}$
D) $\{4, -3\}$ E) $\{-1, 2\}$

$$13. (x+3)^4 + 2(x+3)^2 - 3 = 0 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\{0, 1, 2\}$ B) $\{-1, 0, 1, 2\}$ C) $\{-2, 1, 3\}$
D) $\{-2, -4\}$ E) $\{-3, -4\}$

$$14. 2^{x+1} - 2^{x+2} + 2 = 0 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\{-1, 3\}$ B) $\{0, 1\}$ C) $\{1, 2\}$
D) $\{0\}$ E) $\{-1, 2\}$

$$15. x^2 + \frac{1}{x^2} + x + \frac{1}{x} - 4 = 0 \Rightarrow \Sigma x = ?$$

- A) -4 B) -2 C) -1 D) 0 E) 1

$$16. x^2 - 4x - \sqrt{x^2 - 4x + 4} = -2 \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\{-5, 1\}$ B) $\{-2, 1\}$ C) $\{4, -5\}$
D) $\{0, 4\}$ E) $\{3, 4\}$

$$17. \frac{3}{x^3} - \frac{2}{x^3} - 8 = 0 \Rightarrow x = ?$$

- A) 8 B) 4 C) 2 D) $\frac{1}{2}$ E) $\frac{1}{3}$

$$18. 2^{x^2-7x+6} = 1 \Rightarrow x_1 = ?$$

- A) -6 B) -1 C) 0 D) 1 E) 3

$$19. \sqrt{x + \sqrt{x-4}} = \sqrt{6} \Rightarrow \text{ÇK (SS)} = ?$$

- A) $\{5\}$ B) $\{8\}$ C) $\{5, 8\}$
D) $\{4, 6\}$ E) $\{1\}$

$$20. x - \sqrt{2} = x^2 - 2 \Rightarrow x_1 = ?$$

- A) 2 B) $1 + \sqrt{2}$ C) $2 + \sqrt{2}$
D) $1 - \sqrt{2}$ E) $1 + 2\sqrt{2}$

Yanıtlar / Answers

1. E	2. C	3. D	4. D	5. B	6. C
7. A	8. E	9. B	10. B	11. A	12. A
13. D	14. D	15. C	16. D	17. D	18. D
19. A	20. D				

1. $\begin{cases} a-5 \geq 2a+3 \\ 3a-2 < a-6 \end{cases} \Rightarrow a \in ?$
 A) $a < -8$ B) $a \geq 3$ C) $a \leq -8$
 D) $-8 < a < 3$ E) $1 < a < 4$
2. $4(x+1)-2 > -\frac{1}{2}(x-1) \Rightarrow x \in ?$
 A) $x < 0$ B) $x > \frac{1}{2}$ C) $x > -\frac{1}{3}$
 D) $x < \frac{1}{3}$ E) $x < -1$
3. $a - \frac{a+4}{3} < 4 \Rightarrow a \in ?$
 A) $a < 10$ B) $a > 8$ C) $a < \frac{10}{3}$
 D) $a > 10$ E) $a < 8$
4. $a < \frac{-4}{a+4} \Rightarrow a \in ?$
 A) $a > 4$ B) $a = -4$ C) $a = 4$
 D) $a < -4$ E) $\emptyset$
5. $\frac{(2-x)(x^2+4x-5)}{x+2} \geq 0 \Rightarrow \text{ÇK (SS)} = ?$
 A) $(-\infty, -5) \cup (-2, 1)$
 B) $[-5, -2) \cup (1, 2)$
 C) $[-5, -2] \cup [1, 2]$
 D) $[-5, -2) \cup [1, 2]$
 E) $[1, 2)$
6. $\sqrt{x^2+x} < \sqrt{x+2} \Rightarrow x \in ?$
 A) $\frac{2+\sqrt{5}}{2}$ B) $-1 < x < 1$ C) $\sqrt{3} < x$
 D) $-\sqrt{2} < x < \sqrt{2}$ E) $-\sqrt{5} < x < \sqrt{5}$
7. $2x+4 < 1 \Rightarrow x \in ?$
 A) $x < \frac{3}{2}$ B) $x < -\frac{3}{2}$ C) $x < -1$
 D) $x > 0$ E) $x > -1$
8. $\forall x \in \mathbb{R} \Rightarrow f(x) < 0$
 $f(x) = ax^2 - (a+1)x + a + 1 < 0 \Rightarrow a \in ?$
 A) $0 < a < \frac{1}{8}$ B) $0 < a < \frac{1}{3}$ C) $a < -1$
 D) $a > -1$ E) $-1 < a < 2$
9. $x^2 - 2x - 3 < 0 \Rightarrow x \in ?$
 A) $-3 < x < 1$ B) $-1 < x < 3$ C) $0 < x < 2$
 D) $-2 < x < -1$ E) $-2 < x < 3$
10. $\frac{x-2}{x+2} \leq 0 \Rightarrow x \in ?$
 A) $-2 < x < 2$ B) $-2 < x \leq 2$ C) $-\infty < x < -2$
 D) $-2 \leq x < 2$ E) $-2 \leq x \leq 2$

11. $ax^2 - 3ax + 4a + 8 = 0$, $x_1 \cdot x_2 < 0 \Rightarrow a \in ?$
 A) $0 < a < +\infty$ B) $-4 < a < 0$ C) $-3 < a < 0$
 D) $-2 < a < 0$ E) $-2 \leq a \leq 2$

12. $x \cdot (x^2 - 2x) > 0 \Rightarrow \text{ÇK (SS)} = ?$
 A) $(2, +\infty)$ B) $(-\infty, 0)$ C) $(0, 2)$
 D) $(0, +\infty)$ E) $(-\infty, 0) \cup (2, +\infty)$

13. $\frac{x^2 - 2}{x^2 - 2x - 3} < 0 \Rightarrow \text{ÇK (SS)} = ?$
 A) $(-3, -2)$ B) $(-\sqrt{2}, 3)$
 C) $(-\sqrt{2}, \sqrt{2}) \cup (\sqrt{2}, 3)$ D) $(-\sqrt{2}, \sqrt{2})$
 E) $(-\sqrt{2}, -1) \cup (\sqrt{2}, 3)$

14. $3x^2 - 13x - 10 \leq 0 \Rightarrow \text{ÇK (SS)} = ?$
 A) $(-\infty, -\frac{2}{3})$ B) $(-\frac{2}{3}, 5)$ C) $[-\frac{2}{3}, 5]$
 D) $(5, +\infty)$ E) $(-\infty, -\frac{2}{3}) \cup (5, +\infty)$

15. $x \in \mathbb{Z}$
 $\frac{-(x+2)(x+3)^2}{x} \geq 0 \Rightarrow \min(x) = ?$
 A) -3 B) -2 C) -1 D) 1 E) 2

16. $\frac{x^2 - 16}{x^3 - 64} \leq 0 \Rightarrow x \in ?$
 A) $(4, +\infty)$ B) $(-\infty, -4]$ C) $[-4, 4]$
 D) $[+4, 8]$ E) $[-4, 4] \cup [8, +\infty)$

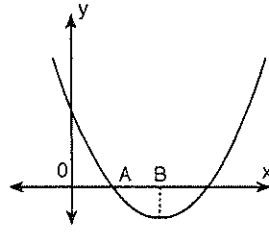
17. $\left. \begin{array}{l} x^2 + 5x + 6 > 0 \\ x^2 - 2x - 3 < 0 \end{array} \right\} \Rightarrow x \in ?$
 A) $(2, 4)$ B) $(-1, 3)$ C) $(-\infty, -1)$
 D) $[-2, 3)$ E) $(-3, 3)$

18. $x^2 - 3mx + 3m > -3 \Rightarrow m \in ?$
 A) $(-7, 3)$ B) $(-\frac{2}{3}, 3)$ C) $(-\frac{2}{3}, 2)$
 D) $(1, +\infty)$ E) $(-\infty, 1] \cup (2, +\infty)$

19. $\frac{3-x}{2x-4} \geq -1 \Rightarrow x \in ?$
 A) $(1, 2)$ B) $(-\infty, 2)$ C) $(-2, 2)$
 D) $(1, +\infty)$ E) $(-\infty, 1] \cup (2, +\infty)$

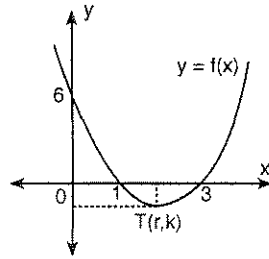
Yanıtlar / Answers					
1. C	2. C	3. E	4. D	5. D	6. D
7. B	8. C	9. B	10. B	11. D	12. A
13. E	14. C	15. A	16. B	17. B	18. C
19. E					

1. $f(x) = x^2 - 12x + m + 8$
 $|AB| = 2|AO|$
 $\Rightarrow m = ?$



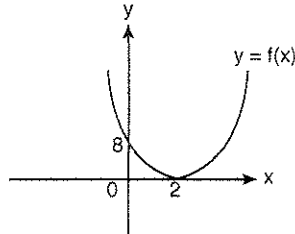
- A) -8 B) -6 C) 18 D) 12 E) 19

2. $f(x) = ax^2 + bx + c$
 $\Rightarrow k = ?$



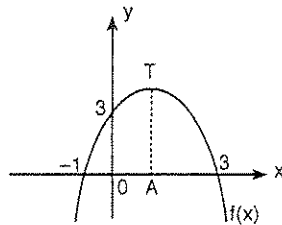
- A) -1 B) -2 C) -3 D) -4 E) -5

3. $f(x) = (x - 2)(ax + b)$
 $\Rightarrow (a, b) = ?$



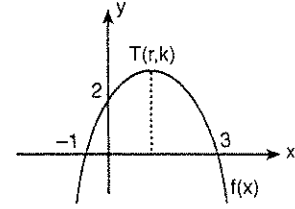
- A) (-1, 2) B) (2, -3) C) (2, -4)
D) (2, -5) E) (2, 4)

4. $y = ax^2 + bx + c$
 $\Rightarrow |TA| = ?$



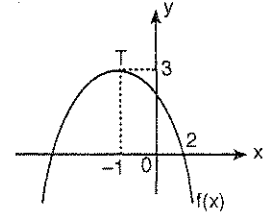
- A) 4 B) 5 C) 6 D) 7 E) 8

5. $y = ax^2 + bx + c$
 $\Rightarrow r = ?$



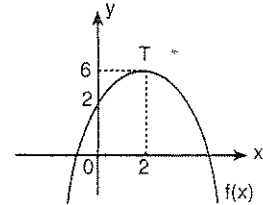
- A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) 1 D) $\frac{3}{2}$ E) 2

6. $f(x) = ax^2 + bx + c$
 $\Rightarrow f(-4) = ?$



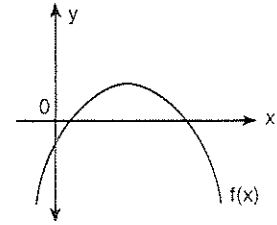
- A) -6 B) -4 C) 0 D) 4 E) 5

7. $f(x) = ax^2 + bx + c$
 $\Rightarrow 5a + b + c = ?$



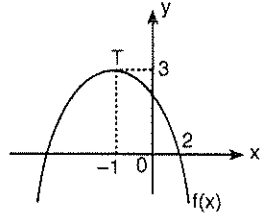
- A) -2 B) -1 C) 0 D) 1 E) 2

8. $f(x) = ax^2 + bx + c$
Buna göre aşağıdakilerden hangisi doğrudur?
Which of the following is correct?



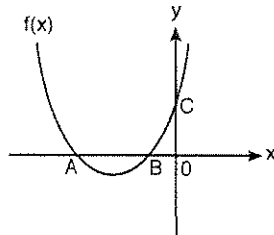
- A) $a \cdot c < 0$ B) $b^2 - 4ac < 0$ C) $a \cdot b > 0$
D) $b \cdot c > 0$ E) $b > 0$

9. $f(x) = ax^2 + bx + c$
 $\Rightarrow f(5) = ?$



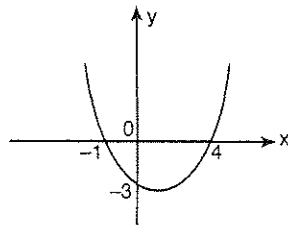
- A) -24 B) -9 C) -6 D) -3 E) 0

10. $f(x) = x^2 + 8x + a + 3$
 $|AB| = 6$
 $\Rightarrow |OC| = ?$



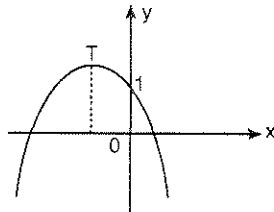
- A) 4 B) 5 C) 6 D) 7 E) 8

11. $f(x) = (ax + b)(x + 1)$
 $\Rightarrow a = ?$



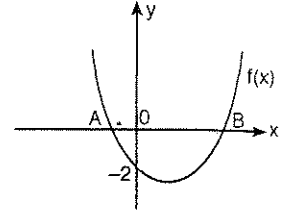
- A) $\frac{3}{4}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) 3 E) 4

12. $f(x) = ax^2 + bx + c$
 $\Rightarrow c = ?$



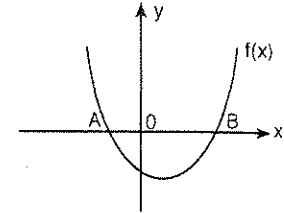
- A) -2 B) 1 C) 2 D) 3 E) 6

13. $y = x^2 - (b-1)x + b - 4$
 $\Rightarrow |AB| = ?$



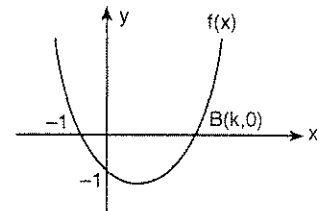
- A) $\sqrt{13}$ B) $\sqrt{17}$ C) 2 D) 3 E) 5

14. $f(x) = x^2 + mx + n$
 $A(n, 0), B(m, 0)$
 $\Rightarrow m + n = ?$



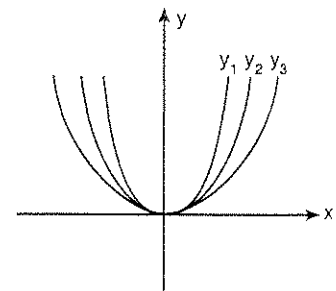
- A) $-\frac{1}{2}$ B) $-\frac{3}{4}$ C) -1 D) -2 E) -3

15. $f(x) = x^2 + ax + b$
 $\Rightarrow k = ?$



- A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2 E) $\frac{5}{2}$

16. $y_1 = ax^2$
 $y_2 = bx^2$
 $y_3 = cx^2$
 $\Rightarrow ? < ? < ?$



- A) $c < b < a$ B) $b < c < a$ C) $a < b < c$
D) $c < a < b$ E) $a < c < b$

Yanitlar / Answers

1. D	2. B	3. C	4. A	5. C	6. C
7. D	8. E	9. A	10. D	11. A	12. B
13. D	14. C	15. B	16. A		

1. $\left(x + \frac{2}{x}\right)^3 - 6\left(\frac{x^2+2}{x}\right) = 9 \Rightarrow x^2 - 3x = ?$

- A) -3 B) -2 C) -1 D) 2 E) 3

2. $\frac{(3-x)(x-2)}{(3-x)-(x-2)} = x \Rightarrow \text{ÇK (SS)} = ?$

- A) $\{\sqrt{6}\}$ B) $\{-\sqrt{6}, \sqrt{6}\}$ C) $\{-2\sqrt{3}, 2\sqrt{3}\}$
D) $\{2, 3\}$ E) $\{-6, +6\}$

3. $\left(x + \frac{3}{x}\right)^2 - 8 - \frac{6}{x} - 2x = 0$ denkleminin kaç farklı reel

kökü vardır? How many different roots exist?

- A) 0 B) 1 C) 2 D) 3 E) 4

4. $\frac{(x-m)(x+3)}{(x-2)} = 0$

$x_1 = x_2$

$\Rightarrow x_1 = ?$

- A) 6 B) -3 C) 3 D) -1 E) -6

5. $-x^2 + (3-k)x - (k-1) = 0$

$x_1^3 \cdot x_2^2 + x_2^3 \cdot x_1^2 = 16 \Rightarrow k = ?$

- A) 3 B) -1 C) -2 D) 2 E) -3

6. $x^2 - (a+4)x - a^2 + 3 = 0$

$x_1 + x_2 = 2$

$\Rightarrow x_1 \cdot x_2 = ?$

- A) -3 B) -2 C) -1 D) 2 E) 3

7. $x^2 + (a+b-10)x + (2a-b+5) = 0$

$x_1 + x_2 = 8$

$x_1 \cdot x_2 = 21$

$\Rightarrow a = ?$

- A) 6 B) 7 C) 8 D) 10 E) 21

8. $x^{\frac{4}{3}} - 5x^{\frac{2}{3}} + 6 = 0 \Rightarrow \text{ÇK (SS)} = ?$

A) $\{-2\sqrt{2}, 2\sqrt{2}\}$

B) $\{-3\sqrt{3}, 3\sqrt{3}\}$

C) $\{-3\sqrt{3}, -2\sqrt{2}, 2\sqrt{2}, 3\sqrt{3}\}$

D) $\{-3\sqrt{3}, -2\sqrt{2}\}$

E) $\{2\sqrt{2}, 3\sqrt{3}\}$

9. $|x+3| - \frac{2}{\sqrt{x^2+6x+9}} = 1 \Rightarrow \sum x = ?$

- A) 0 B) -2 C) -3 D) -6 E) 5

10. $x^4 + 5x^2 - 1 = 0$ denkleminin kaç gerçel kökü vardır?

How many real roots exist?

- A) 0 B) 1 C) 2 D) 3 E) 4

11. $x \in \mathbb{Z}$,

$4 \leq x^2 - 4x + 4 \leq 25 \Rightarrow \sum x = ?$

- A) 16 B) 18 C) 22 D) 25 E) 30

12. $\sqrt{x-1} < 3-x \Rightarrow \text{ÇK (SS)} = ?$

- A) $-1 < x < 2$ B) $x < -1$ C) $4 \leq x < 5$
D) $1 < x < 2$ E) $x > 5$

13. $\frac{x}{x-2} - \frac{3}{x} > 2 \Rightarrow \text{ÇK(SS)} = ?$

- A) $(-2, 0) \cup (2, 4)$ B) $(-3, 0) \cup (2, 3)$
C) $(-\infty, -2)$ D) $(-2, 0) \cup (2, 3)$
E) $(3, +\infty)$

14. $\forall x \in \mathbb{R},$

$(a-1)x^2 - 2(a+1)x + a + 2 = 0 \Rightarrow a \in ?$

- A) $a < 12$ B) $a < 3$ C) $a < -2$
D) $a > -12$ E) $a > -3$

15. $\frac{(x-2)(x^2+4x+4)}{x^2+2x+1} \leq 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $[-\infty, -1] \cup (2, \infty)$ B) $(2, \infty)$
C) $(-\infty, -1) \cup [2, \infty)$ D) $(-\infty, -1) \cup (-1, 2]$
E) $(1, 2]$

16. $a \in \mathbb{R}^-$

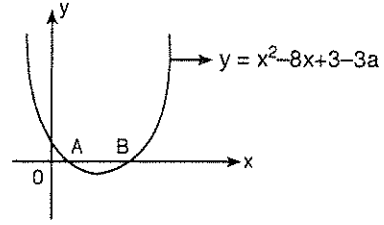
$\frac{(x+1)^4(x^2-a)}{x^3-2x^2-3x} \leq 0 \Rightarrow \text{ÇK (SS)} = ?$

- A) $\mathbb{R}^- - (-3, -1)$ B) $\mathbb{R}^- - [-3, -1]$
C) $(-\infty, -1) \cup (0, 3)$ D) $(-1, 0) \cup (3, +\infty)$
E) $\mathbb{R} - (0, 3)$

17. $|2x+1| \leq |2x+5| \Rightarrow \text{ÇK (SS)} = ?$

- A) $[-\frac{3}{2}, +\infty)$ B) $[-2, +\infty)$ C) $[-\frac{5}{2}, +\infty)$
D) $[-3, +\infty)$ E) $[-\frac{7}{2}, +\infty)$

18.

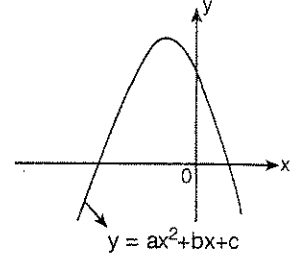


$y = x^2 - 8x + 3 - 3a, |AB| = 2 \Rightarrow a = ?$

- A) 2 B) -4 C) 4 D) 3 E) -3

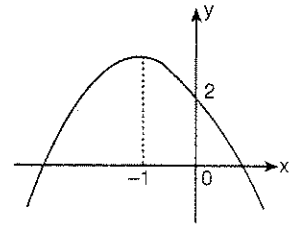
19. Hangisi doğrudur?

Which one is correct?



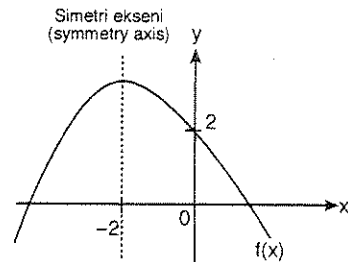
- A) $\frac{a}{c} > 0$ B) $\frac{b}{2a} < 0$ C) $b^2 - 4ac < 0$
D) $b > 0$ E) $a.b.c > 0$

20. $f(x) = -mx^2 - 2nx + k$
 $\Rightarrow m + n + k = ?$



- A) $n-2$ B) $2+n$ C) $5n+2$
D) $2-5n$ E) $2n+2$

21.



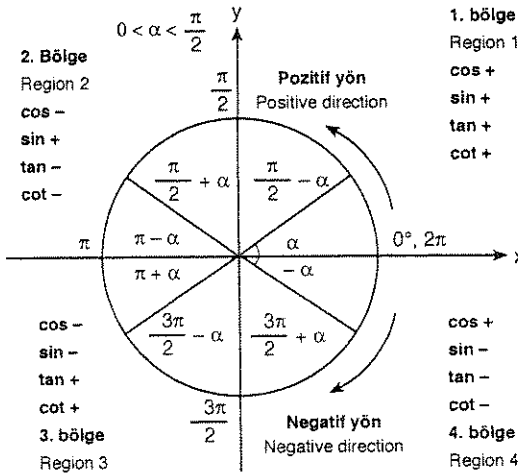
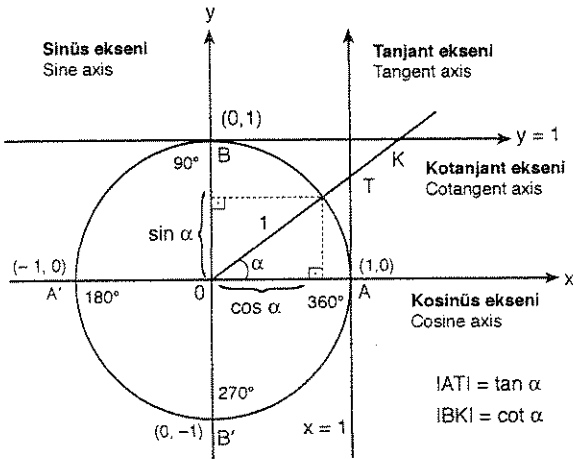
$f(x) = (m-1)x^2 - (2m+1)x + k, m+k = ?$

- A) $\frac{5}{2}$ B) $-\frac{3}{2}$ C) $\frac{9}{4}$ D) $-\frac{9}{4}$ E) $-\frac{7}{4}$

Yanıtlar / Answers

1. B	2. B	3. C	4. B	5. B	6. C
7. A	8. C	9. D	10. C	11. A	12. D
13. D	14. E	15. D	16. C	17. A	18. B
19. E	20. E	21. A			

● BİRİM ÇEMBER / THE UNIT CIRCLE



Örnek / Example:

$a = \sin 108^\circ$, $b = \cos 316^\circ$, $c = \tan 286^\circ$, $d = \cot 183^\circ$ olduğuna göre, a , b , c , d nin işaretleri sırasıyla aşağıdakilerden hangisidir?

What are the signs of above angles?

- A) -, -, +, - B) -, +, -, + C) +, +, -, +
D) +, -, +, - E) +, +, -, -

Çözüm / Solution:

$$\frac{a}{+} \frac{b}{+} \frac{c}{-} \frac{d}{+}$$

Yanıt / Answer C

● AÇI ÖLÇÜ BİRİMLERİ / UNITS of ANGLE

$$\frac{D}{180^\circ} = \frac{R}{\pi} = \frac{G}{200}$$

www.douknowturkey.com

Örnek / Example:

$$255^\circ = ? R$$

- A) $\frac{2\pi}{3}$ B) $\frac{11\pi}{15}$ C) $\frac{4\pi}{5}$ D) $\frac{5\pi}{4}$ E) $\frac{7\pi}{4}$

Çözüm / Solution:

$$\frac{D}{180} = \frac{R}{\pi} \Rightarrow \frac{225}{180} = \frac{R}{\pi} \Rightarrow \frac{5}{4} = \frac{R}{\pi} \Rightarrow R = \frac{5\pi}{4}$$

Yanıt / Answer D

Örnek / Example:

$$50 G = ? R$$

- A) $\frac{3\pi}{4}$ B) $\frac{5\pi}{6}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{3}$ E) $\frac{\pi}{6}$

Çözüm / Solution:

$$\frac{R}{\pi} = \frac{G}{200} \Rightarrow \frac{R}{\pi} = \frac{50}{200} \Rightarrow \frac{R}{\pi} = \frac{1}{4} \Rightarrow R = \frac{\pi}{4}$$

Yanıt / Answer C

Örnek / Example:

$$\frac{3\pi}{5} = ?^\circ$$

- A) 72° B) 108° C) 124° D) 135° E) 140°

Çözüm / Solution:

$$\frac{R}{\pi} = \frac{D}{180} \Rightarrow \frac{3\pi}{5\pi} = \frac{D}{180} \Rightarrow D = \frac{3 \cdot 180}{5} = 108^\circ$$

Yanıt / Answer B

Örnek / Example:

$$18^\circ = ? G$$

- A) 20 B) 24 C) 32 D) 36 E) 40

Çözüm / Solution:

$$\frac{D}{180} = \frac{G}{200} \Rightarrow \frac{18}{180} = \frac{G}{200} \Rightarrow \frac{1}{10} = \frac{G}{200} \Rightarrow G = 20$$

Yanıt / Answer A



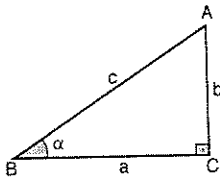
DİK ÜÇGENDE TRİGONOMETRİK ORANLAR TRIGONOMETRIC RATIOS in a RIGHT TRIANGLE

$$\sin \alpha = \frac{b}{c}$$

$$\cos \alpha = \frac{a}{c}$$

$$\tan \alpha = \frac{b}{a}$$

$$\cot \alpha = \frac{a}{b}$$



$$\tan \alpha = \frac{\sin \alpha}{\cos \alpha}$$

$$\cot \alpha = \frac{\cos \alpha}{\sin \alpha}$$

$$\sec \alpha = \frac{1}{\cos \alpha}$$

$$\operatorname{cosec} \alpha = \frac{1}{\sin \alpha}$$

$$\sec \alpha = \frac{c}{a}$$

$$\operatorname{cosec} \alpha = \frac{c}{b}$$

Örnek / Example:

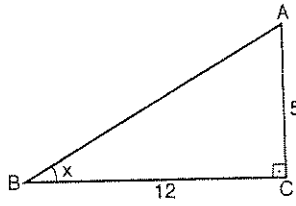
$$[AC] \perp [BC],$$

$$|AC| = 5 \text{ cm},$$

$$|BC| = 12 \text{ cm}$$

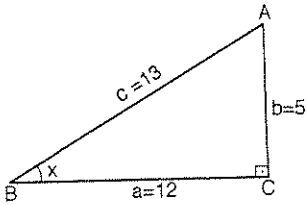
$$m(\widehat{ABC}) = x$$

$$\operatorname{cosec} x \cdot \cos x \cdot \cot x = ?$$



- A) $\frac{25}{169}$ B) $\frac{169}{25}$ C) $\frac{25}{144}$ D) $\frac{144}{25}$ E) $\frac{144}{169}$

Çözüm / Solution:



$$c^2 = 12^2 + 5^2 = 169$$

$$c = 13$$

$$\begin{aligned} \operatorname{cosec} x \cdot \cos x \cdot \cot x &= \frac{13}{5} \cdot \frac{12}{13} \cdot \frac{12}{5} \\ &= \frac{144}{25} \end{aligned}$$

Yanıt / Answer D

Örnek / Example:

$$2 \sin 42^\circ - 3 \cos 48^\circ + \frac{1}{\operatorname{cosec} 42^\circ} + 15 = ?$$

- A) $\cos x + 15$ B) 15 C) $\sin 42^\circ + 15$
D) 14 E) 13

Çözüm / Solution:

$$\begin{aligned} 2 \sin 42^\circ - 3 \cos 48^\circ + \frac{1}{\operatorname{cosec} 42^\circ} + 15 \\ = 2 \cdot \sin 42^\circ - 3 \sin 42^\circ + \sin 42^\circ + 15 = 15 \end{aligned}$$

Yanıt / Answer B

Örnek / Example:

$$\frac{\sin x + 2 \cos x}{3 \sin x - 4 \cos x} = 2 \Rightarrow \tan x = ?$$

- A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) $\frac{5}{3}$ E) 2

Çözüm / Solution:

$$\frac{\sin x + 2 \cos x}{3 \sin x - 4 \cos x} = 2$$

$$\Rightarrow \sin x + 2 \cos x = 6 \sin x - 8 \cos x$$

$$\Rightarrow 10 \cos x = 5 \sin x$$

$$\Rightarrow \frac{\sin x}{\cos x} = \frac{10}{5} \Rightarrow \tan x = 2$$

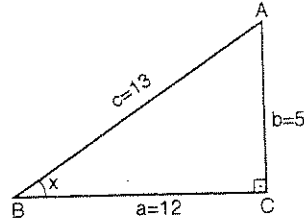
Yanıt / Answer E

Örnek / Example:

$$0 < x < \frac{\pi}{2}, \tan x = \frac{5}{12}$$

$$\sin x = ?, \cos x = ?, \cot x = ?$$

Çözüm / Solution:



$$\tan x = \frac{b}{a} = \frac{5}{12}$$

$$c^2 = 25 + 144 = 169 \Rightarrow c = 13$$

$$\sin x = \frac{5}{13}$$

$$\cos x = \frac{12}{13}$$

$$\cot x = \frac{12}{5}$$

Örnek / Example:

$$\pi < x < \frac{3\pi}{2}, \sin x = -\frac{3}{5}$$

$$\cos x = ?, \tan x = ?, \sec x = ?$$

Çözüm / Solution:

$$\pi < x < \frac{3\pi}{2}$$

III. bölgede, (In 3rd region)

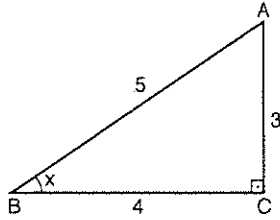
$$\sin x < 0, \cos x < 0, \tan x > 0, \cot x > 0$$

$$\sec x < 0, \csc x < 0$$

$$\cos x = -\frac{4}{5}$$

$$\tan x = \frac{3}{4}$$

$$\sec x = -\frac{5}{4}$$



Örnek / Example:

$$x \in \left(\frac{3\pi}{2}, 2\pi\right), \tan x = -2$$

$$\cos x \cdot \sin^2 x - \sin x \cdot \cos^2 x = ?$$

A) $-\frac{2\sqrt{5}}{5}$

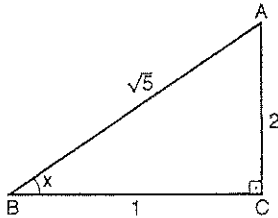
B) $-\frac{6\sqrt{5}}{25}$

C) $\frac{2\sqrt{5}}{25}$

D) $\frac{6\sqrt{5}}{25}$

E) $\frac{\sqrt{5}}{5}$

Çözüm / Solution:



$$x \in \left(\frac{3\pi}{2}, 2\pi\right)$$

IV. bölgede, / In 4th region

$$\cos x > 0, \sin x < 0$$

$$\sin x = -\frac{2}{\sqrt{5}}, \cos x = \frac{1}{\sqrt{5}}$$

$$\begin{aligned} \cos x \cdot \sin^2 x - \sin x \cdot \cos^2 x &= \frac{1}{\sqrt{5}} \cdot \frac{4}{5} + \frac{2}{\sqrt{5}} \cdot \frac{1}{5} \\ &= \frac{6}{5\sqrt{5}} \\ &= \frac{6\sqrt{5}}{25} \end{aligned}$$

Yanıt / Answer D



TEMEL AÇILARIN DEĞERLERİ

VALUES of the BASIC ANGLES

x	0°	30°	45°	60°	90°
sin x	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos x	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan x	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Belirsiz Indefinite
cot x	Belirsiz Indefinite	$\sqrt{3}$	1	$\frac{\sqrt{3}}{3}$	0

$$\sin 180^\circ = 0$$

$$\cos 180^\circ = -1$$

$$\tan 180^\circ = 0$$

$$\cot 180^\circ = \text{Belirsiz Indefinite}$$

$$\sin 270^\circ = -1$$

$$\cos 270^\circ = 0$$

$$\tan 270^\circ = \text{Belirsiz Indefinite}$$

$$\cot 270^\circ = 0$$



TRİGONOMETRİK ÖZDEŞLİKLER

TRIGONOMETRIC IDENTITIES

i. $\sin^2 x + \cos^2 x = 1$

ii. $\tan x \cdot \cot x = 1$

iii. $\cos x = \sqrt{1 - \sin^2 x}$

iv. $\sin x = \sqrt{1 - \cos^2 x}$

v. $\tan x = \frac{\sin x}{\sqrt{1 - \sin^2 x}} = \frac{\sqrt{1 - \cos^2 x}}{\cos x} = \frac{\sin x}{\cos x}$

vi. $\tan^2 x + 1 = \frac{1}{\cos^2 x} = \sec^2 x$

vii. $\cot x = \frac{\sqrt{1 - \sin^2 x}}{\sin x} = \frac{\cos x}{\sqrt{1 - \cos^2 x}} = \frac{\cos x}{\sin x}$

viii. $\cot^2 x + 1 = \frac{1}{\sin^2 x} = \csc^2 x$



**ÖLÇÜSÜ 90° DEN BÜYÜK OLAN AÇILARIN
TRİGONOMETRİK DEĞERLERİ
TRIGONOMETRIC VALUES of ANGLES
with a SIZE GREATER THAN 90°**

$$0 < \alpha < 90^\circ \Rightarrow$$

1. Bölge / 1st region

$$\text{i. } \sin\left(\frac{\pi}{2} - \alpha\right) = \cos \alpha$$

$$\text{ii. } \cos\left(\frac{\pi}{2} - \alpha\right) = \sin \alpha$$

$$\text{iii. } \tan\left(\frac{\pi}{2} - \alpha\right) = \cot \alpha$$

$$\text{iv. } \cot\left(\frac{\pi}{2} - \alpha\right) = \tan \alpha$$

2. Bölge / 2nd region

$$\sin\left(\frac{\pi}{2} + \alpha\right) = \cos \alpha \quad \sin(\pi - \alpha) = \sin \alpha$$

$$\cos\left(\frac{\pi}{2} + \alpha\right) = -\sin \alpha \quad \cos(\pi - \alpha) = -\cos \alpha$$

$$\tan\left(\frac{\pi}{2} + \alpha\right) = -\cot \alpha \quad \tan(\pi - \alpha) = -\tan \alpha$$

$$\cot\left(\frac{\pi}{2} + \alpha\right) = -\tan \alpha \quad \cot(\pi - \alpha) = -\cot \alpha$$

3. Bölge / 3rd region

$$\sin\left(\frac{3\pi}{2} - \alpha\right) = -\cos \alpha \quad \sin(\pi + \alpha) = -\sin \alpha$$

$$\cos\left(\frac{3\pi}{2} - \alpha\right) = -\sin \alpha \quad \cos(\pi + \alpha) = -\cos \alpha$$

$$\tan\left(\frac{3\pi}{2} - \alpha\right) = \cot \alpha \quad \tan(\pi + \alpha) = \tan \alpha$$

$$\cot\left(\frac{3\pi}{2} - \alpha\right) = \tan \alpha \quad \cot(\pi + \alpha) = \cot \alpha$$

4. Bölge / 4th region

$$\sin\left(\frac{3\pi}{2} + \alpha\right) = -\cos \alpha \quad \sin(2\pi - \alpha) = -\sin \alpha$$

$$\cos\left(\frac{3\pi}{2} + \alpha\right) = \sin \alpha \quad \cos(2\pi - \alpha) = \cos \alpha$$

$$\tan\left(\frac{3\pi}{2} + \alpha\right) = -\cot \alpha \quad \tan(2\pi - \alpha) = -\tan \alpha$$

$$\cot\left(\frac{3\pi}{2} + \alpha\right) = -\tan \alpha \quad \cot(2\pi - \alpha) = -\cot \alpha$$

Örnek / Example:

225° nin trigonometrik oranları nedir?

What are the trigonometric values of 225°?

Çözüm / Solution:

$$\sin 225^\circ = \sin\left(\pi + \frac{\pi}{4}\right) = -\sin \frac{\pi}{4} = -\sin 45^\circ = -\frac{\sqrt{2}}{2}$$

$$\cos 225^\circ = \cos\left(\pi + \frac{\pi}{4}\right) = -\cos \frac{\pi}{4} = -\cos 45^\circ = -\frac{\sqrt{2}}{2}$$

$$\tan 225^\circ = \tan\left(\pi + \frac{\pi}{4}\right) = \tan \frac{\pi}{4} = \tan 45^\circ = 1$$

$$\cot 225^\circ = \cot\left(\pi + \frac{\pi}{4}\right) = \cot \frac{\pi}{4} = \cot 45^\circ = 1$$

Örnek / Example:

120° nin trigonometrik oranları nedir?

What are the trigonometric values of 120°?

Çözüm / Solution:

$$\sin 120^\circ = \sin\left(\pi - \frac{\pi}{3}\right) = \sin \frac{\pi}{3} = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 120^\circ = \cos\left(\pi - \frac{\pi}{3}\right) = -\cos \frac{\pi}{3} = -\cos 60^\circ = -\frac{1}{2}$$

$$\tan 120^\circ = \tan\left(\pi - \frac{\pi}{3}\right) = -\tan \frac{\pi}{3} = -\tan 60^\circ = -\sqrt{3}$$

$$\cot 120^\circ = \cot\left(\pi - \frac{\pi}{3}\right) = -\cot \frac{\pi}{3} = -\cot 60^\circ = -\frac{\sqrt{3}}{3}$$

Örnek / Example:

$\tan 300^\circ = ?$

- A) 1 B) $\frac{\sqrt{3}}{3}$ C) $\sqrt{3}$ D) -1 E) $-\sqrt{3}$

Çözüm / Solution:

$$360^\circ - 300^\circ = 60^\circ$$

$$\tan 300^\circ = -\tan 60^\circ = -\sqrt{3}$$

Yanıt / Answer E



NEGATİF AÇILARIN TRİGONOMETRİK DEĞERLERİ

TRIGONOMETRIC VALUES of NEGATIVE ANGLES

$$\sin(-\alpha) = -\sin \alpha$$

$$\cos(-\alpha) = \cos \alpha$$

$$\tan(-\alpha) = -\tan \alpha$$

$$\cot(-\alpha) = -\cot \alpha$$

Örnek / Example:

$$\sin(-300^\circ) = ?$$

A) $-\frac{1}{2}$ B) $-\frac{\sqrt{3}}{2}$ C) $-\frac{\sqrt{2}}{2}$ D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

Çözüm / Solution:

$$\sin(-300^\circ) = -\sin 300^\circ$$

$$= -\sin\left(2\pi - \frac{\pi}{3}\right) = -\left(-\sin \frac{\pi}{3}\right) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

Yanıt / Answer E

Örnek / Example:

$$\tan(-870^\circ) = ?$$

A) $-\frac{1}{2}$ B) $\frac{\sqrt{3}}{3}$ C) $-\frac{\sqrt{2}}{2}$ D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

Çözüm / Solution:

$$\begin{array}{c|c} 870^\circ & 360^\circ \\ 720^\circ & 2 \\ \hline 150^\circ & \end{array}$$

$$\tan(-870^\circ) = -\tan 870^\circ = -\tan 150^\circ$$

$$= -\tan\left(\pi - \frac{\pi}{6}\right) = -\left(-\tan \frac{\pi}{6}\right) = \tan 30^\circ = \frac{\sqrt{3}}{3}$$

Yanıt / Answer B



TOPLAM VE FARK FORMÜLLERİ

THE FORMULAS of SUM and DIFFERENCE

$$\sin(a+b) = \sin a \cdot \cos b + \cos a \cdot \sin b$$

$$\sin(a-b) = \sin a \cdot \cos b - \cos a \cdot \sin b$$

$$\cos(a+b) = \cos a \cdot \cos b - \sin a \cdot \sin b$$

$$\cos(a-b) = \cos a \cdot \cos b + \sin a \cdot \sin b$$

$$\tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \cdot \tan b}$$

$$\tan(a-b) = \frac{\tan a - \tan b}{1 + \tan a \cdot \tan b}$$

$$\cot(a+b) = \frac{\cot a \cdot \cot b - 1}{\cot b + \cot a}$$

$$\cot(a-b) = \frac{\cot a \cdot \cot b + 1}{\cot b - \cot a}$$

Örnek / Example:

$$\tan 15^\circ - \cot 15^\circ = ?$$

A) $-2\sqrt{3}$ B) $-2\sqrt{2}$ C) $-\sqrt{3}$ D) $2\sqrt{2}$ E) $2\sqrt{3}$

Çözüm / Solution:

$$\begin{aligned} \tan 15^\circ - \cot 15^\circ &= \frac{\sin 15^\circ}{\cos 15^\circ} - \frac{\cos 15^\circ}{\sin 15^\circ} \\ &= \frac{\sin^2 15^\circ - \cos^2 15^\circ}{\sin 15^\circ \cdot \cos 15^\circ} \\ &= -\frac{\cos 30^\circ}{\frac{1}{2} \sin 30^\circ} \\ &= -\frac{\frac{\sqrt{3}}{2}}{\frac{1}{4}} = -2\sqrt{3} \end{aligned}$$

Yanıt / Answer A

Örnek / Example:

$$\frac{\cos 15^\circ}{\cos 45^\circ} - \frac{\sin 15^\circ}{\sin 45^\circ} = ?$$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 1 D) 2 E) 3

Çözüm / Solution:

$$\begin{aligned} \frac{\cos 15^\circ}{\cos 45^\circ} - \frac{\sin 15^\circ}{\sin 45^\circ} &= \frac{\sin 45^\circ \cdot \cos 15^\circ - \cos 45^\circ \cdot \sin 15^\circ}{\sin 45^\circ \cdot \cos 45^\circ} \\ &= \frac{\sin(45^\circ - 15^\circ)}{\frac{1}{2} \sin 90^\circ} \\ &= \frac{\sin 30^\circ}{\frac{1}{2} \cdot 1} = \frac{\frac{1}{2}}{\frac{1}{2}} = 1 \end{aligned}$$

Yanıt / Answer C

Örnek / Example:

$$\frac{\cot^2 22,5^\circ - 1}{2 \cot 22,5^\circ} = ?$$

- A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) 1 D) $\sqrt{2}$ E) 2

Çözüm / Solution:

$$\begin{aligned} \frac{\cot^2 22,5^\circ - 1}{2 \cot 22,5^\circ} &= \frac{\cos^2 22,5^\circ - \sin^2 22,5^\circ}{2 \sin^2 22,5^\circ \cdot \frac{\cos 22,5^\circ}{\sin 22,5^\circ}} \\ &= \frac{\cos 45^\circ}{2 \sin 22,5^\circ \cdot \cos 22,5^\circ} = \frac{\cos 45^\circ}{\sin 45^\circ} \\ &= \cot 45^\circ = 1 \end{aligned}$$

Yanıt / Answer C

Örnek / Example:

$$\tan 15^\circ = ?$$

- A) $1 + \sqrt{3}$ B) $2 - \sqrt{3}$ C) $1 - \sqrt{3}$
D) $2 + \sqrt{3}$ E) $\frac{2 - \sqrt{3}}{2}$

Çözüm / Solution:

$$\begin{aligned} \tan 15^\circ &= \tan(45^\circ - 30^\circ) \\ &= \frac{\tan 45^\circ - \tan 30^\circ}{1 + \tan 45^\circ \cdot \tan 30^\circ} \\ &= \frac{1 - \frac{\sqrt{3}}{3}}{1 + \frac{\sqrt{3}}{3}} \\ &= \frac{3 - \sqrt{3}}{3 + \sqrt{3}} \\ &= \frac{(3 - \sqrt{3})^2}{(3 + \sqrt{3})(3 - \sqrt{3})} = \frac{12 - 6\sqrt{3}}{6} \\ &= 2 - \sqrt{3} \end{aligned}$$

Yanıt / Answer B

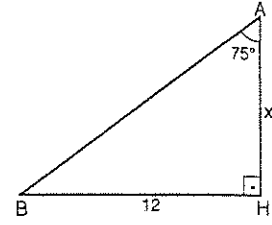
Örnek / Example:

$$[AH] \perp [BH],$$

$$|BH| = 12 \text{ cm},$$

$$m(\widehat{BAH}) = 75^\circ$$

$$|AH| = x = ? \text{ cm}$$



- A) $12 \cdot (2 - \sqrt{3})$ B) $6 \cdot (1 + \sqrt{3})$ C) $4 \cdot (2 - \sqrt{3})$
D) 6 E) 8

Çözüm / Solution:

$$\begin{aligned} \tan 75^\circ &= \tan(45^\circ + 30^\circ) \\ &= \frac{\tan 45^\circ + \tan 30^\circ}{1 - \tan 45^\circ \cdot \tan 30^\circ} = \frac{3 + \sqrt{3}}{3 - \sqrt{3}} \\ \tan 75^\circ &= \frac{12 + 6\sqrt{3}}{6} = 2 + \sqrt{3} \\ \tan 75^\circ &= \frac{12}{x} = 2 + \sqrt{3} \\ x &= \frac{12}{\tan 75^\circ} = \frac{12}{2 + \sqrt{3}} = \frac{12 \cdot (2 - \sqrt{3})}{1} \\ x &= 12 \cdot (2 - \sqrt{3}) \end{aligned}$$

Yanıt / Answer A

Örnek / Example:

$$\cot 105^\circ = ?$$

- A) $2 + \sqrt{3}$ B) $2 - \sqrt{3}$ C) $-(2 - \sqrt{3})$
D) $\sqrt{3} + 1$ E) $-\sqrt{3} + 1$

Çözüm / Solution:

$$\begin{aligned} \cot 105^\circ &= \cot(60^\circ + 45^\circ) \\ &= \frac{\cot 60^\circ \cdot \cot 45^\circ - 1}{\cot 60^\circ + \cot 45^\circ} \\ &= \frac{\sqrt{3} - 3}{\sqrt{3} + 3} \\ &= \frac{(\sqrt{3} - 3)^2}{(\sqrt{3} + 3)(\sqrt{3} - 3)} \\ &= \frac{12 - 6\sqrt{3}}{3 - 9} \\ &= -(2 - \sqrt{3}) \end{aligned}$$

Yanıt / Answer C



YARIM AÇI FORMÜLLERİ / HALF ANGLE FORMULAS

i. $\sin 2a = 2 \sin a \cdot \cos a$

ii. $\cos 2a = \cos^2 a - \sin^2 a = 2 \cos^2 a - 1 = 1 - 2 \sin^2 a$

iii. $\tan 2a = \frac{2 \tan a}{1 - \tan^2 a}$

iv. $\cot 2a = \frac{\cot^2 a - 1}{2 \cot a}$

v. $\sin 2a = \frac{2 \tan a}{1 + \tan^2 a}$

vi. $\cos 2a = \frac{1 - \tan^2 a}{1 + \tan^2 a}$

Örnek / Example:

$$\frac{\sin 4x + \sin 2x}{2 \cos^2 2x - 2 \sin^2 x + 1} = ?$$

- A) $\cot 2x$ B) $\tan 2x$ C) $\tan 2x + 1$
D) $\sec 2x$ E) $\operatorname{cosec} x + 1$

Çözüm / Solution:

$$\begin{aligned} \frac{\sin 4x + \sin 2x}{2 \cos^2 2x - 2 \sin^2 x + 1} &= \frac{2 \sin 2x \cdot \cos 2x + \sin 2x}{2 \cos^2 2x + (1 - 2 \sin^2 x)} \\ &= \frac{\sin 2x \cdot (2 \cos 2x + 1)}{2 \cos^2 2x + \cos 2x} \\ &= \frac{\sin 2x \cdot (2 \cos 2x + 1)}{\cos 2x \cdot (2 \cos 2x + 1)} \\ &= \frac{\sin 2x}{\cos 2x} = \tan 2x \end{aligned}$$

Yanıt / Answer B

Örnek (Example) :

$$\frac{2 \tan 15^\circ}{1 + \tan^2 15^\circ} = ?$$

- A) 1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{1}{4}$ E) $\frac{\sqrt{3}}{4}$

Çözüm / Solution:

$$\begin{aligned} \frac{2 \cdot \tan 15^\circ}{1 + \tan^2 15^\circ} &= \frac{2 \cdot \frac{\sin 15^\circ}{\cos 15^\circ}}{1 + \frac{\sin^2 15^\circ}{\cos^2 15^\circ}} \\ &= \frac{2 \cdot \frac{\sin 15^\circ}{\cos 15^\circ}}{\frac{\cos^2 15^\circ + \sin^2 15^\circ}{\cos^2 15^\circ}} \\ &= \frac{2 \sin 15^\circ}{\cos 15^\circ} \cdot \cos^2 15^\circ \\ &= 2 \sin 15^\circ \cdot \cos 15^\circ \\ &= \sin 30^\circ = \frac{1}{2} \end{aligned}$$

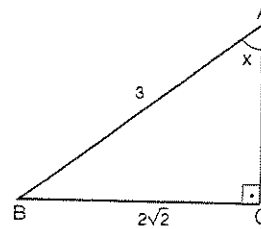
Yanıt / Answer B

Örnek (Example) :

$$\cos x = \frac{1}{3} \text{ ve (and) } x \in (0, \frac{\pi}{2}) \Rightarrow \tan 2x = ?$$

- A) $\frac{3\sqrt{2}}{5}$ B) $\frac{4\sqrt{2}}{7}$ C) $\frac{6\sqrt{2}}{7}$
D) $\frac{-4\sqrt{2}}{7}$ E) $\frac{5}{2}$

Çözüm / Solution:



$$\begin{aligned} \tan 2x &= \frac{2 \tan x}{1 - \tan^2 x} \\ &= \frac{2 \cdot 2\sqrt{2}}{1 - (2\sqrt{2})^2} \\ &= \frac{4\sqrt{2}}{1 - 8} = \frac{-4\sqrt{2}}{7} \end{aligned}$$

Yanıt / Answer D

**DÖNÜŞÜM FORMÜLLERİ / CONVERSION FORMULAS**

$$\sin a + \sin b = 2 \cdot \sin\left(\frac{a+b}{2}\right) \cdot \cos\left(\frac{a-b}{2}\right)$$

$$\sin a - \sin b = 2 \cdot \sin\left(\frac{a-b}{2}\right) \cdot \cos\left(\frac{a+b}{2}\right)$$

$$\cos a + \cos b = 2 \cdot \cos\left(\frac{a+b}{2}\right) \cdot \cos\left(\frac{a-b}{2}\right)$$

$$\cos a - \cos b = -2 \cdot \sin\left(\frac{a+b}{2}\right) \cdot \sin\left(\frac{a-b}{2}\right)$$

Örnek / Example:

$$\frac{\sin x - \sin 3x + \sin 5x}{\cos x - \cos 3x + \cos 5x} = ?$$

- A) $\sin 2x$ B) $\cos 2x$ C) $\cot 4x$
D) $\cot 3x$ E) $\tan 3x$

Çözüm / Solution:

$$\begin{aligned} \frac{\sin x - \sin 3x + \sin 5x}{\cos x - \cos 3x + \cos 5x} &= \frac{\sin 5x + \sin x - \sin 3x}{\cos 5x + \cos x - \cos 3x} \\ &= \frac{2 \sin 3x \cdot \cos 2x - \sin 3x}{2 \cos 3x \cdot \cos 2x - \cos 3x} \\ &= \frac{\sin 3x (2 \cos 2x - 1)}{\cos 3x (2 \cos 2x - 1)} \\ &= \frac{\sin 3x}{\cos 3x} \\ &= \tan 3x \end{aligned}$$

Yanıt / Answer E**Örnek / Example:**

$$\frac{1}{\sin 15^\circ} + \frac{1}{\cos 15^\circ} = ?$$

- A) $2\sqrt{3}$ B) $4\sqrt{2}$ C) 4 D) $2\sqrt{6}$ E) $4\sqrt{3}$

Çözüm / Solution:

$$\begin{aligned} \frac{1}{\sin 15^\circ} + \frac{1}{\cos 15^\circ} &= \frac{\cos 15^\circ + \sin 15^\circ}{\sin 15^\circ \cdot \cos 15^\circ} = \frac{\sin 75^\circ + \sin 15^\circ}{\frac{1}{2} \sin 30^\circ} \\ &= \frac{2 \sin 45^\circ \cdot \cos 30^\circ}{\frac{1}{4}} = 8 \cdot \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} \\ &= 2\sqrt{6} \end{aligned}$$

Yanıt / Answer D**TERS DÖNÜŞÜM FORMÜLLERİ
INVERSE CONVERSION FORMULAS**

$$\sin a \cdot \sin b = -\frac{1}{2} [\cos(a+b) - \cos(a-b)]$$

$$\cos a \cdot \cos b = \frac{1}{2} [\cos(a+b) + \cos(a-b)]$$

$$\sin a \cdot \cos b = \frac{1}{2} [\sin(a+b) + \sin(a-b)]$$

$$\cos a \cdot \sin b = \frac{1}{2} [\sin(a+b) - \sin(a-b)]$$

Örnek / Example:

$$\frac{\sin 83^\circ - \sin 32^\circ}{\sin 68^\circ - \sin 22^\circ} = ?$$

- A) $\frac{1}{2}$ B) $\sqrt{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{1}{4}$ E) $\frac{\sqrt{3}}{4}$

Çözüm / Solution:

$$\begin{aligned} \frac{\sin 83^\circ - \sin 37^\circ}{\sin 68^\circ - \sin 22^\circ} &= \frac{2 \sin \frac{83^\circ - 37^\circ}{2} \cdot \cos \frac{83^\circ + 37^\circ}{2}}{2 \sin \frac{68^\circ - 22^\circ}{2} \cdot \cos \frac{68^\circ + 22^\circ}{2}} \\ &= \frac{\sin 23^\circ \cdot \cos 60^\circ}{\sin 23^\circ \cdot \cos 45^\circ} \\ &= \frac{\frac{1}{2}}{\frac{\sqrt{2}}{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \end{aligned}$$

Yanıt / Answer C**Örnek / Example:**

$$\frac{\cos 79^\circ + \cos 41^\circ}{\cos 49^\circ + \cos 11^\circ} = ?$$

- A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $2\sqrt{3}$ D) 2 E) $\frac{\sqrt{3}}{3}$

Çözüm / Solution:

$$\begin{aligned} \frac{\cos 79^\circ + \cos 41^\circ}{\cos 49^\circ + \cos 11^\circ} &= \frac{2 \cos \frac{79^\circ + 41^\circ}{2} \cdot \cos \frac{79^\circ - 41^\circ}{2}}{2 \cos \frac{49^\circ + 11^\circ}{2} \cdot \cos \frac{49^\circ - 11^\circ}{2}} \\ &= \frac{\cos 60^\circ \cdot \cos 19^\circ}{\cos 30^\circ \cdot \cos 19^\circ} \\ &= \frac{\cos 60^\circ}{\cos 30^\circ} = \frac{1}{2} \cdot \frac{2}{\sqrt{3}} \\ &= \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3} \end{aligned}$$

Yanıt / Answer E

Örnek / Example:

$$\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 80^\circ = ?$$

- A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{12}$ E) $\frac{1}{16}$

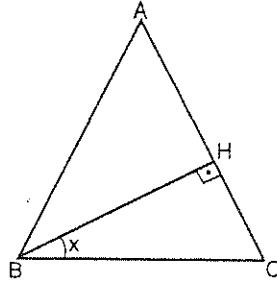
Çözüm / Solution:

$$\begin{aligned} \cos 20^\circ \cdot \cos 40^\circ \cdot \cos 80^\circ &= \frac{\sin 40^\circ}{2 \sin 20^\circ} \cdot \frac{\sin 80^\circ}{2 \sin 40^\circ} \cdot \frac{\sin 160^\circ}{2 \sin 80^\circ} \\ &= \frac{1}{8} \end{aligned}$$

Yanıt / Answer C

Örnek / Example:

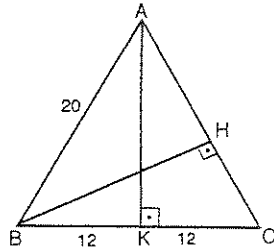
- [BH] $\perp$ [AC],
|AB| = 2 cm,
|AC| = 20 cm,
|BC| = 24 cm
cosec x = ?



- A) $\frac{4}{5}$ B) $\frac{3}{5}$ C) $\frac{5}{4}$ D) 2 E) $\frac{5}{3}$

Çözüm / Solution:

- [AK] $\perp$ [BC]
|AK| = 16
 $16 \cdot 24 = 20 \cdot |BH|$
|BH| = 19,2 cm



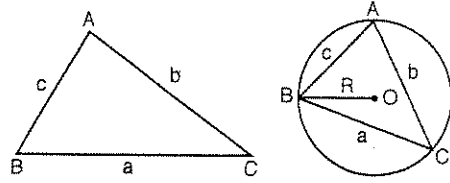
$$\cos x = \frac{19,2}{24} = \frac{192}{240} = \frac{4}{5} \Rightarrow \sin x = \frac{3}{5}$$

$$\operatorname{cosec} x = \frac{1}{\frac{3}{5}} = \frac{5}{3}$$

Yanıt / Answer E



SİNÜS TEOREMİ / THE SINE THEOREM



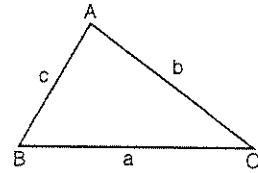
$$\frac{a}{\sin \hat{A}} = \frac{b}{\sin \hat{B}} = \frac{c}{\sin \hat{C}} = 2R$$

R : Çevrel çemberin yarıçapı / Radius of circumcircle

$$A(\triangle ABC) = \frac{1}{2} \cdot b \cdot c \cdot \sin \hat{A} = \frac{1}{2} \cdot a \cdot c \cdot \sin \hat{B} = \frac{1}{2} \cdot a \cdot b \cdot \sin \hat{C}$$



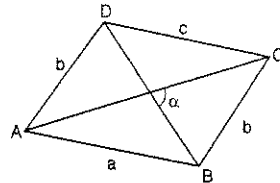
KOSİNÜS TEOREMİ / THE COSINE THEOREM



$$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos \hat{A}$$

$$b^2 = a^2 + c^2 - 2 \cdot a \cdot c \cdot \cos \hat{B}$$

$$c^2 = a^2 + b^2 - 2 \cdot a \cdot b \cdot \cos \hat{C}$$



$$A(ABCD) = \frac{1}{2} \cdot |AC| \cdot |BD| \cdot \sin \alpha$$

Örnek / Example:

$|AE| = 2$ cm,

$|EB| = 6$ cm,

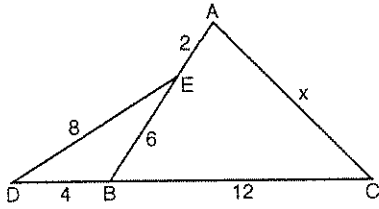
$|DB| = 4$ cm,

$|DE| = 8$ cm,

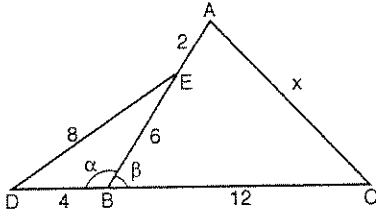
$|BC| = 12$ cm

$|AC| = x = ?$ cm

A) $6\sqrt{3}$ B) $8\sqrt{2}$ C) $4\sqrt{5}$ D) $4\sqrt{10}$ E) $5\sqrt{6}$



Çözüm / Solution:



EBD üçgeninde / in EBD triangle

$$64 = 16 + 36 - 2 \cdot 4 \cdot 6 \cos \alpha$$

$$48 \cdot \cos \alpha = 52 - 64$$

$$48 \cdot \cos \alpha = -12 \Rightarrow \cos \alpha = -\frac{1}{4}$$

$$\alpha + \beta = 180^\circ$$

$$\cos \beta = -\cos \alpha = -\left(-\frac{1}{4}\right) = \frac{1}{4}$$

ABC üçgeninde / in ABC triangle

$$x^2 = 8^2 + 12^2 - 2 \cdot 8 \cdot 12 \cdot \cos \beta$$

$$\Rightarrow x^2 = 64 + 144 - 2 \cdot 8 \cdot 12 \cdot \frac{1}{4}$$

$$\Rightarrow x^2 = 208 - 48$$

$$\Rightarrow x^2 = 160 = 16 \cdot 10$$

$$\Rightarrow x = 4\sqrt{10}$$

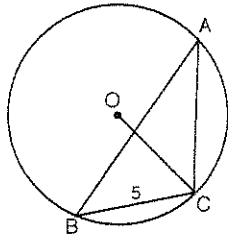
Yanıt / Answer D

Örnek / Example:

$|CO| = 6$ cm,

$|BC| = 5$ cm

$\sin A = ?$



A) $\frac{5}{6}$ B) $\frac{5}{3}$ C) $\frac{3}{4}$ D) $\frac{2}{5}$ E) $\frac{5}{12}$

Çözüm / Solution:

$$\frac{|BC|}{\sin A} = 2 \cdot R \Rightarrow \sin A = \frac{5}{2 \cdot 6} = \frac{5}{12}$$

Yanıt / Answer E



TERS TRİGONOMETRİK FONKSİYONLAR

THE INVERSE TRIGONOMETRIC FUNCTIONS

1. $y = \arcsin x \Leftrightarrow x = \sin y$

$x \in [-1, 1]$ ve (and) $y \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

Örnek / Example:

$y = \arcsin\left(\frac{\sqrt{3}}{2}\right) \Rightarrow y = ?$

A) $\frac{\pi}{6}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{3}$ D) $\frac{2\pi}{3}$ E) $\frac{5\pi}{3}$

Çözüm / Solution:

$y = \arcsin\left(\frac{\sqrt{3}}{2}\right) \Rightarrow \sin y = \frac{\sqrt{3}}{2}$

$y \in \left(0, \frac{\pi}{2}\right) \Rightarrow y = \frac{\pi}{3}$

Yanıt / Answer C

Örnek / Example:

$y = \arcsin\left(-\frac{1}{2}\right) \Rightarrow y = ?$

A) $\frac{\pi}{6}$ B) $\frac{7\pi}{6}$ C) $\frac{5\pi}{6}$ D) $\frac{4\pi}{3}$ E) $\frac{11\pi}{3}$

Çözüm / Solution:

$y = \arcsin\left(-\frac{1}{2}\right) \Rightarrow \sin y = -\frac{1}{2}$

$y \in \left[\frac{3\pi}{2}, 2\pi\right] \Rightarrow y = 2\pi - \frac{\pi}{6}$

$y = \frac{11\pi}{6}$

Yanıt / Answer E

2. $y = \arccos x \Leftrightarrow x = \cos y$
 $x \in [-1, 1]$ ve (and) $y \in [0, \pi]$

Örnek / Example:

$$x = \arccos\left(\frac{1}{2}\right) \Rightarrow x = ?$$

A) $\frac{2\pi}{3}$ B) $\frac{\pi}{3}$ C) $\frac{5\pi}{6}$ D) $\frac{4\pi}{3}$ E) $\frac{5\pi}{3}$

Çözüm / Solution:

$$x = \arccos\left(\frac{1}{2}\right) \Rightarrow \cos x = \frac{1}{2}$$

$$x \in (0, \pi) \Rightarrow x = \frac{\pi}{3}$$

Yanıt / Answer B

Örnek / Example:

$$A = \arccos \frac{\sqrt{2}}{\sqrt{3}} - \arccos \frac{\sqrt{6}+1}{2\sqrt{3}} \Rightarrow A = ?$$

A) $\frac{\pi}{3}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{2\pi}{3}$ E) $\frac{5\pi}{6}$

Çözüm / Solution:

$$a = \arccos \frac{\sqrt{2}}{\sqrt{3}} \Rightarrow \cos a = \frac{\sqrt{2}}{\sqrt{3}}$$

$$b = \arccos \frac{\sqrt{6}+1}{2\sqrt{3}} \Rightarrow \cos b = \frac{\sqrt{6}+1}{2\sqrt{3}}$$

$$A = a - b \Rightarrow \cos A = \cos(a - b)$$

$$\cos A = \cos a \cdot \cos b + \sin a \cdot \sin b$$

$$= \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{6}+1}{2\sqrt{3}} + \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{5-2\sqrt{6}}}{2\sqrt{3}}$$

$$= \frac{\sqrt{12} + \sqrt{2}}{6} + \frac{\sqrt{3} - \sqrt{2}}{6}$$

$$= \frac{2\sqrt{3} + \sqrt{3}}{6} = \frac{3\sqrt{3}}{6} = \frac{\sqrt{3}}{2}$$

$$\cos A = \frac{\sqrt{3}}{2} \Rightarrow A = \frac{\pi}{6}$$

Yanıt / Answer C

3. $y = \arctan x \Leftrightarrow x = \tan y$
 $x \in \mathbb{R}$ ve (and) $y \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Örnek / Example:

$$a = \arctan(\sqrt{3}) \Rightarrow a = ?$$

A) $\frac{3\pi}{4}$ B) $\frac{5\pi}{3}$ C) $\frac{7\pi}{6}$ D) $\frac{\pi}{6}$ E) $\frac{\pi}{3}$

Çözüm / Solution:

$$a = \arctan(\sqrt{3}) \Rightarrow \tan a = \sqrt{3}$$

$$a \in (0, \frac{\pi}{2}) \Rightarrow a = \frac{\pi}{3}$$

Yanıt / Answer E

Örnek / Example:

$$B = \arctan(3 + 2\sqrt{2}) - \arctan \frac{\sqrt{2}}{2} \Rightarrow B = ?$$

A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{2\pi}{3}$ D) $\frac{\pi}{4}$ E) $\frac{7\pi}{4}$

Çözüm / Solution:

$$a = \arctan(3 + 2\sqrt{2}) \Rightarrow \tan a = 3 + 2\sqrt{2}$$

$$b = \arctan\left(\frac{\sqrt{2}}{2}\right) \Rightarrow \tan b = \frac{\sqrt{2}}{2}$$

$$B = a - b$$

$$\tan B = \frac{\tan a - \tan b}{1 + \tan a \cdot \tan b}$$

$$\tan B = \frac{3 + 2\sqrt{2} - \frac{\sqrt{2}}{2}}{1 + (3 + 2\sqrt{2}) \cdot \frac{\sqrt{2}}{2}}$$

$$\tan B = \frac{6 + 4\sqrt{2} - \sqrt{2}}{2 + 3\sqrt{2} + 4}$$

$$\tan B = \frac{6 + 3\sqrt{2}}{6 + 3\sqrt{2}} = 1$$

$$\tan B = 1 \Rightarrow B = \frac{\pi}{4}$$

Yanıt / Answer D

4. $y = \operatorname{arccot} x \Leftrightarrow x = \cot y$
 $x \in \mathbb{R}$ ve (and) $y \in [0, \pi]$

Örnek / Example:

$$x = \operatorname{arccot} \left(\frac{\sqrt{3}}{3} \right) \Rightarrow x = ?$$

- A) $\frac{2\pi}{3}$ B) $\frac{3\pi}{4}$ C) $\frac{4\pi}{3}$ D) $\frac{\pi}{3}$ E) $\frac{\pi}{6}$

Çözüm / Solution:

$$x = \operatorname{arccot} \left(\frac{\sqrt{3}}{3} \right) \Rightarrow \cot x = \frac{\sqrt{3}}{3}$$

$$x \in \left(0, \frac{\pi}{2} \right) \Rightarrow x = \frac{\pi}{3}$$

Yanıt / Answer D

Örnek / Example:

$$\sin \left[\frac{1}{2} \operatorname{arccot} \left(-\frac{3}{4} \right) \right] = ?$$

- A) $\frac{1}{\sqrt{6}}$ B) $\frac{\sqrt{6}}{3}$ C) $\frac{\sqrt{3}}{4}$ D) $\frac{\sqrt{3}}{5}$ E) $\frac{2\sqrt{5}}{5}$

Çözüm / Solution:

$$A = \sin \left[\frac{1}{2} \operatorname{arccot} \left(-\frac{3}{4} \right) \right]$$

$$\operatorname{arccot} \left(-\frac{3}{4} \right) = a$$

$$\cot a = -\frac{3}{4}$$

$$\cos a = -\frac{3}{5}$$

$$A = \sin \frac{a}{2} = \frac{\sqrt{1 - \cos a}}{\sqrt{2}}$$

$$A = \frac{\sqrt{1 + \frac{3}{5}}}{\sqrt{2}} = \frac{\sqrt{\frac{8}{5}}}{\sqrt{2}}$$

$$A = \frac{2\sqrt{2}}{\sqrt{5} \cdot \sqrt{2}} = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$

Yanıt / Answer E

ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

1. $0 < x < \frac{\pi}{2}$, $\sin x = 0,6 \Rightarrow \tan x = ?$

- A) $\frac{5}{3}$ B) $\frac{4}{3}$ C) $\frac{3}{4}$ D) $\frac{3}{5}$ E) $\frac{1}{2}$

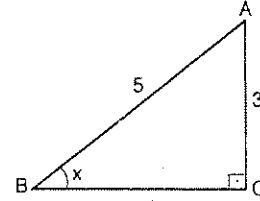
Çözüm / Solution:

$$\sin x = 0,6$$

$$\sin x = \frac{6}{10}$$

$$\sin x = \frac{3}{5}$$

$$\sin x = \frac{|AC|}{|AB|}$$



$$|AB|^2 = |AC|^2 + |BC|^2$$

$$5^2 = 3^2 + |BC|^2 \Rightarrow |BC| = 4$$

$$\tan x = \frac{|AC|}{|BC|} = \frac{3}{4}$$

Yanıt / Answer C

2. $\cos x = \frac{1}{4} \Rightarrow \cos 2x = ?$

- A) $-\frac{8}{9}$ B) $-\frac{7}{8}$ C) $-\frac{7}{9}$
D) $-\frac{8}{11}$ E) $-\frac{6}{7}$

Çözüm / Solution:

$$\cos x = \frac{1}{4}$$

$$\cos 2x = 2 \cdot \cos^2 x - 1$$

$$\cos 2x = 2 \cdot \left(\frac{1}{4} \right)^2 - 1$$

$$= 2 \cdot \frac{1}{16} - 1$$

$$= \frac{2}{16} - 1$$

$$= \frac{1}{8} - 1$$

$$= -\frac{7}{8}$$

Yanıt / Answer B

3. $\sin x - \cos x = \frac{5}{13} \Rightarrow \sin 2x = ?$

- A) $\frac{25}{169}$ B) $\frac{48}{169}$ C) $\frac{108}{169}$
D) $\frac{144}{169}$ E) $\frac{145}{169}$

Çözüm / Solution:

$$\begin{aligned}\sin x - \cos x &= \frac{5}{13} \\ (\sin x - \cos x)^2 &= \left(\frac{5}{13}\right)^2 \\ \sin^2 x - 2\sin x \cdot \cos x + \cos^2 x &= \frac{25}{169} \\ \underbrace{\sin^2 x + \cos^2 x}_1 - 2\sin x \cdot \cos x &= \frac{25}{169} \\ 1 - \sin 2x &= \frac{25}{169} \\ 1 - \frac{25}{169} &= \sin 2x \\ \frac{144}{169} &= \sin 2x\end{aligned}$$

Yanıt / Answer D

4. $\cos\left(\frac{11\pi}{3}\right) = ?$

- A) $\frac{1}{2}$ B) $\frac{3}{5}$ C) $\frac{3}{4}$ D) $\frac{4}{5}$ E) $\frac{9}{10}$

Çözüm / Solution:

$$\begin{aligned}\cos\left(\frac{11\pi}{3}\right) &= \cos 660^\circ \quad \left(\frac{11\pi}{3} = 660^\circ\right) \\ &= \cos(360^\circ + 300^\circ) \\ &= \cos 300^\circ \\ &= \cos 180^\circ \cdot \cos 120^\circ - \sin 180^\circ \cdot \sin 120^\circ \\ &= -1 \cdot \cos 120^\circ - 0 \cdot \sin 120^\circ \\ &= -\cos 120^\circ \\ &= -\cos(90^\circ + 30^\circ) \\ &= -[\cos 90^\circ \cdot \cos 30^\circ - \sin 90^\circ \cdot \sin 30^\circ] \\ &= -(0 \cdot \cos 30^\circ - 1 \cdot \frac{1}{2}) \\ &= -\left(-\frac{1}{2}\right) = \frac{1}{2}\end{aligned}$$

Yanıt / Answer A

5. $\sin 10^\circ = m \Rightarrow \sin 70^\circ = ?$

- A) $2m$ B) $m^2 - 1$ C) $2m^2 - 1$
D) $1 - m^2$ E) $1 - 2m^2$

Çözüm / Solution:

$$\begin{aligned}\sin 10^\circ = m &\Rightarrow \sin 70^\circ = \cos 20^\circ \\ &= \cos(2 \cdot 10^\circ) \\ &= 1 - 2 \cdot \sin^2 10^\circ \\ &= 1 - 2m^2\end{aligned}$$

Yanıt / Answer E

6. $\tan 210^\circ = ?$

- A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\frac{1}{\sqrt{2}}$ D) $\frac{1}{\sqrt{3}}$ E) $\frac{1}{2}$

Çözüm / Solution:

$$\begin{aligned}\tan 210^\circ &= \tan(180^\circ + 30^\circ) \\ &= \frac{\tan 180^\circ + \tan 30^\circ}{1 - \tan 180^\circ \cdot \tan 30^\circ} \\ &= \frac{0 + \frac{1}{\sqrt{3}}}{1 - 0 \cdot \frac{1}{\sqrt{3}}} \\ &= \frac{\frac{1}{\sqrt{3}}}{1} = \frac{1}{\sqrt{3}}\end{aligned}$$

Yanıt / Answer D

7. $\frac{\sin 300^\circ}{1 - \cos 240^\circ} = ?$

- A) $-\sqrt{3}$ B) $-\frac{\sqrt{3}}{2}$ C) $-\frac{\sqrt{3}}{3}$
D) $-\frac{\sqrt{2}}{2}$ E) -1

Çözüm / Solution:

$$\begin{aligned}\sin 300^\circ &= \sin (360^\circ - 60^\circ) \\ &= \sin 360^\circ \cdot \cos 60^\circ - \cos 360^\circ \cdot \sin 60^\circ \\ &= 0 \cdot \frac{1}{2} - 1 \cdot \frac{\sqrt{3}}{2} \\ &= -\frac{\sqrt{3}}{2}\end{aligned}$$

$$\begin{aligned}\cos 240^\circ &= \cos (180^\circ + 60^\circ) \\ &= \cos 180^\circ \cdot \cos 60^\circ - \sin 180^\circ \cdot \sin 60^\circ \\ &= -1 \cdot \frac{1}{2} - 0 \cdot \frac{\sqrt{3}}{2} \\ &= -\frac{1}{2}\end{aligned}$$

$$\begin{aligned}\frac{\sin 300^\circ}{1 - \cos 240^\circ} &= \frac{-\frac{\sqrt{3}}{2}}{1 - \left(-\frac{1}{2}\right)} = \frac{-\frac{\sqrt{3}}{2}}{1 + \frac{1}{2}} \\ &= \frac{-\frac{\sqrt{3}}{2}}{\frac{3}{2}} \\ &= -\frac{\sqrt{3}}{3}\end{aligned}$$

Yanıt / Answer C

8. $\cos 165^\circ = ?$

- A) $\frac{-\sqrt{6} + \sqrt{2}}{2}$ B) $\frac{-\sqrt{6} - \sqrt{2}}{4}$ C) $\frac{\sqrt{6} - \sqrt{2}}{4}$
D) $\frac{\sqrt{6} + \sqrt{2}}{4}$ E) $\frac{\sqrt{3} - \sqrt{2}}{2}$

Çözüm / Solution:

$$\begin{aligned}\cos 165^\circ &= \cos (180^\circ - 15^\circ) \\ &= \cos 180^\circ \cdot \cos 15^\circ + \sin 180^\circ \cdot \sin 15^\circ \\ &= (-1) \cdot \cos 15^\circ + 0 \cdot \sin 15^\circ \\ &= -\cos 15^\circ \\ &= -\cos (45^\circ - 30^\circ) \\ &= -[\cos 45^\circ \cdot \cos 30^\circ + \sin 45^\circ \cdot \sin 30^\circ] \\ &= -\left[\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2}\right] = \frac{-\sqrt{6} - \sqrt{2}}{4}\end{aligned}$$

Yanıt / Answer B

9. $\frac{\sin 77^\circ + \cos 47^\circ}{\sin 73^\circ} = ?$

- A) $2\sqrt{3} \sin 17^\circ$ B) $\sqrt{3}$ C) $2\sqrt{3}$
D) $2\sqrt{2} \cos 17^\circ$ E) $\tan 17^\circ$

Çözüm / Solution:

$$\begin{aligned}\frac{\sin 77^\circ + \cos 47^\circ}{\sin 73^\circ} &= \frac{\sin 77^\circ + \sin 43^\circ}{\cos 17^\circ} \\ &= \frac{2 \cdot \sin \left(\frac{77^\circ + 43^\circ}{2}\right) \cdot \cos \left(\frac{77^\circ - 43^\circ}{2}\right)}{\cos 17^\circ} \\ &= \frac{2 \cdot \sin 60^\circ \cdot \cos 17^\circ}{\cos 17^\circ} \\ &= 2 \cdot \frac{\sqrt{3}}{2} = \sqrt{3}\end{aligned}$$

Yanıt / Answer B

10. $\frac{\pi}{2} < x < \pi, \tan x = -\frac{4}{3} \Rightarrow \cos x = ?$

- A) $-\frac{3}{5}$ B) $-\frac{4}{5}$ C) $\frac{3}{5}$
D) $\frac{4}{5}$ E) $\frac{2}{5}$

Çözüm / Solution:

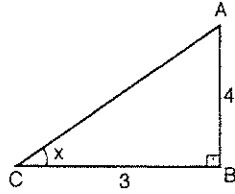
$$\tan x = -\frac{4}{3}$$

$$|AC|^2 = |AB|^2 + |BC|^2$$

$$|AC|^2 = 4^2 + 3^2$$

$$|AC| = 5$$

$$\cos x = -\frac{3}{5}$$



Yanıt / Answer A

11. $\cos 75^\circ + \cos 15^\circ = ?$

- A) $\frac{\sqrt{3}}{3}$ B) $\frac{\sqrt{6}}{2}$ C) $\sqrt{3}$
D) $\frac{\sqrt{3}}{2}$ E) $\frac{\sqrt{6}}{3}$

Çözüm / Solution:

$$\cos 75^\circ + \cos 15^\circ = 2 \cdot \cos \frac{75^\circ + 15^\circ}{2} \cdot \cos \frac{75^\circ - 15^\circ}{2}$$

$$= 2 \cdot \cos 45^\circ \cdot \cos 30^\circ$$

$$= 2 \cdot \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}$$

$$= \frac{\sqrt{6}}{2}$$

Yanıt / Answer B

12. $\frac{\pi}{2} < x < \frac{3\pi}{4}, \tan x = -3 \Rightarrow \cos 2x = ?$

- A) $-\frac{2}{5}$ B) $-\frac{3}{5}$ C) $-\frac{4}{5}$
D) $-\frac{9}{10}$ E) $-\frac{14}{15}$

Çözüm / Solution:

$$\tan x = -3$$

$$\cos 2x = 2\cos^2 x - 1$$

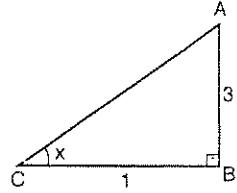
$$= 2 \cdot \left(\frac{1}{\sqrt{10}}\right)^2 - 1$$

$$= 2 \cdot \frac{1}{10} - 1$$

$$= \frac{2}{10} - 1$$

$$= -\frac{8}{10}$$

$$= -\frac{4}{5}$$



$$|AC|^2 = |AB|^2 + |BC|^2$$

$$|AC|^2 = 3^2 + 1^2$$

$$|AC| = 10$$

$$|AC| = \sqrt{10}$$

Yanıt / Answer C

13. $(\sin x - \cos x)^2 + (\sin x + \cos x)^2 = ?$

- A) -3 B) -2 C) 0 D) 2 E) 3

Çözüm / Solution:

$$(\sin x - \cos x)^2 + (\sin x + \cos x)^2$$

$$= \sin^2 x + \cos^2 x - 2\sin x \cdot \cos x + \sin^2 x + \cos^2 x + 2\sin x \cdot \cos x$$

$$= 1 - \sin 2x + 1 + \sin 2x$$

$$= 2$$

Yanıt / Answer D

14. $\sin(4x - 35^\circ) = \frac{\sqrt{2}}{2} \Rightarrow \text{ÇK(SS)} = ?$

- A) $\{25,5^\circ ; 57,5^\circ\}$ B) $\{27,5^\circ ; 55^\circ\}$
 C) $\{22,5^\circ ; 45^\circ\}$ D) $\{25^\circ ; 45^\circ\}$
 E) $\{42,5^\circ ; 20^\circ\}$

Çözüm / Solution:

$$\sin(4x - 35^\circ) = \frac{\sqrt{2}}{2}$$

$$\sin(4x - 35^\circ) = \sin 45^\circ$$

$$4x - 35^\circ = 45^\circ$$

$$4x = 80^\circ$$

$$x = 20^\circ$$

$$\sin(4x - 35^\circ) = \sin 135^\circ$$

$$4x - 35^\circ = 135^\circ$$

$$4x = 170^\circ$$

$$x = 42,5^\circ$$

$$\text{ÇK(SS)} = \{20^\circ ; 42,5^\circ\}$$

Yanıt / Answer E

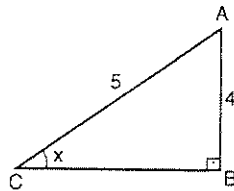
15. $0 < x < \frac{\pi}{2}, \sin x = 0,8 \Rightarrow \cos 2x - \sin 2x = ?$

- A) $-\frac{31}{25}$ B) $-\frac{27}{25}$ C) -1
 D) $-\frac{17}{25}$ E) $-\frac{12}{25}$

Çözüm / Solution:

$$\sin x = \frac{8}{10}$$

$$\sin x = \frac{4}{5}$$



$$|AC|^2 = |AB|^2 + |BC|^2$$

$$5^2 = 4^2 + |BC|^2$$

$$|BC| = 3$$

$$\cos x = \frac{3}{5}$$

$$\cos 2x - \sin 2x = 2\cos^2 x - 1 - 2 \cdot \sin x \cdot \cos x$$

$$= 2 \cdot \left(\frac{3}{5}\right)^2 - 1 - 2 \cdot \frac{4}{5} \cdot \frac{3}{5}$$

$$= \frac{18}{25} - \frac{25}{25} - \frac{24}{25}$$

$$= -\frac{31}{25}$$

Yanıt / Answer A

16. $\sin \frac{19\pi}{3} \cdot \cos \frac{17\pi}{3} = ?$

- A) $\frac{\sqrt{3}}{3}$ B) $\frac{\sqrt{3}}{4}$ C) $\frac{\sqrt{2}}{3}$ D) $\frac{\sqrt{2}}{2}$ E) $\frac{\sqrt{3}}{2}$

Çözüm / Solution:

$$\frac{19 \cdot \pi}{3} = \frac{19 \cdot 180^\circ}{3}$$

$$= 1140^\circ$$

$$= 3 \cdot 360^\circ + 60^\circ$$

$$= 60^\circ$$

$$\frac{17 \cdot \pi}{3} = \frac{17 \cdot 180^\circ}{3}$$

$$= 1020^\circ$$

$$= 2 \cdot 360^\circ + 300^\circ$$

$$= 300^\circ$$

$$\cos 300^\circ = \cos(360^\circ - 60^\circ)$$

$$= \cos 360^\circ \cdot \cos 60^\circ + \sin 360^\circ \cdot \sin 60^\circ$$

$$= 1 \cdot \cos 60^\circ + 0 \cdot \sin 60^\circ$$

$$\sin \frac{19 \cdot \pi}{3} \cdot \cos \frac{17 \cdot \pi}{3} = \sin 60^\circ \cdot \frac{1}{2}$$

$$= \frac{\sqrt{3}}{2} \cdot \frac{1}{2}$$

$$= \frac{\sqrt{3}}{4}$$

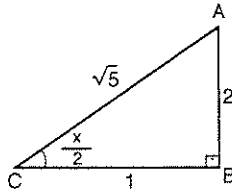
Yanıt / Answer B

17. $\tan \frac{x}{2} = 2 \Rightarrow \sin x = ?$

- A) $\frac{9}{10}$ B) $\frac{5}{6}$ C) $\frac{4}{5}$
 D) $\frac{3}{5}$ E) $\frac{2}{5}$

Çözüm / Solution:

$$\tan \frac{x}{2} = 2$$



$$\sin 2x = 2 \sin x \cdot \cos x$$

$$\sin x = 2 \cdot \sin \frac{x}{2} \cdot \cos \frac{x}{2}$$

$$|AC|^2 = |AB|^2 + |BC|^2$$

$$|AC|^2 = 4 + 1$$

$$|AC| = \sqrt{5}$$

$$\sin x = 2 \cdot \frac{2}{\sqrt{5}} \cdot \frac{1}{\sqrt{5}} = \frac{4}{5}$$

Yanıt / Answer C

18. $0 < x < 2\pi$

$$2\sin^2 x - 5 \cdot \sin x + 2 = 0$$

$$\Rightarrow \text{ÇK (SS)} = ?$$

A) $\{60^\circ, 150^\circ\}$ B) $\{45^\circ, 135^\circ\}$ C) $\{60^\circ, 120^\circ\}$

D) $\{30^\circ, 150^\circ\}$ E) $\{30^\circ, 120^\circ\}$

Çözüm / Solution:

$$2\sin^2 x - 5 \cdot \sin x + 2 = 0$$

$$(2\sin x - 1) \cdot (\sin x - 2) = 0$$

$$2\sin x - 1 = 0 \quad \text{veya (or)} \quad \sin x - 2 = 0$$

$$\sin x = \frac{1}{2} \quad \text{veya (or)} \quad \sin x = 2$$

$$x = 30^\circ \quad , \quad x = 150^\circ$$

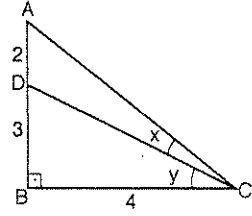
$$\text{ÇK(SS)} = \{30^\circ, 150^\circ\}$$

Yanıt / Answer D

19.

$$\left. \begin{array}{l} |AD| = 2 \\ |DB| = 3 \\ |BC| = 4 \end{array} \right\}$$

$$\Rightarrow \tan x = ?$$



A) $\frac{18}{31}$

B) $\frac{15}{31}$

C) $\frac{12}{31}$

D) $\frac{10}{31}$

E) $\frac{8}{31}$

Çözüm / Solution:

$$\tan(x + y) = \frac{\tan x + \tan y}{1 - \tan x \cdot \tan y}$$

$$\frac{5}{4} = \frac{\tan x + \frac{3}{4}}{1 - \tan x \cdot \frac{3}{4}}$$

$$\frac{5}{4} = \frac{\tan x + \frac{3}{4}}{1 - \frac{3\tan x}{4}}$$

$$\frac{5}{4} = \frac{\frac{4\tan x + 3}{4}}{\frac{4 - 3\tan x}{4}}$$

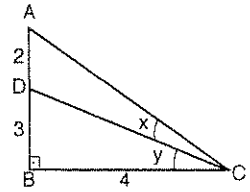
$$\frac{5}{4} = \frac{4\tan x + 3}{4 - 3\tan x}$$

$$16\tan x + 12 = 20 - 15\tan x$$

$$31\tan x = 8$$

$$\tan x = \frac{8}{31}$$

Yanıt / Answer E



20. $\frac{\cos 37^\circ}{\sin 127^\circ} = ?$

A) $-\cos 37^\circ$

B) -1

C) 1

D) $\cos 37^\circ$

E) $\tan 37^\circ$

Çözüm / Solution:

$$\sin 127^\circ = \sin (90^\circ + 37^\circ)$$

$$= \sin 90^\circ \cdot \cos 37^\circ + \cos 90^\circ \cdot \sin 37^\circ$$

$$\frac{\cos 37^\circ}{\sin 127^\circ} = \frac{\cos 37^\circ}{\cos 37^\circ} = 1$$

Yanıt / Answer C

YÖS SORULARI / YÖS QUESTIONS

1. $\frac{1 + \sin^2 p - \cos^2 p}{2 \sin^2 p} = ?$

- A) 0 B) 1 C) 2
D) $\sin p$ E) $\cos p$

(YÖS 1981)

Çözüm / Solution:

$$\begin{aligned} \frac{1 + \sin^2 p - \cos^2 p}{2 \cdot \sin^2 p} &= \frac{\sin^2 p + \cos^2 p + \sin^2 p - \cos^2 p}{2 \sin^2 p} \\ &= \frac{2 \sin^2 p}{2 \sin^2 p} \\ &= 1 \end{aligned}$$

Yanıt / Answer B

2. $\sin(\pi + \alpha) = ?$

- A) $\cos(\pi - \alpha)$ B) $\cos(\pi - \alpha)$ C) $2(\sin \alpha)$
D) $\cos(-\alpha)$ E) $\sin(-\alpha)$

(YÖS 1984)

Çözüm / Solution:

$$\begin{aligned} \sin(\pi + \alpha) &= \sin \pi \cdot \cos \alpha + \cos \pi \cdot \sin \alpha \\ &= 0 \cdot \cos \alpha + (-1) \cdot \sin \alpha \\ &= -\sin \alpha \end{aligned}$$

Yanıt / Answer E

3. $\sin 120^\circ = ?$

- A) $\cos 30^\circ$ B) $-\sin 30^\circ$ C) $-\cos 120^\circ$
D) $-\cos 30^\circ$ E) $\sin 30^\circ$

(YÖS 1985)

Çözüm / Solution:

$$\begin{aligned} \sin 120^\circ &= \sin(180^\circ - 60^\circ) \\ &= \sin 180^\circ \cdot \cos 60^\circ - \cos 180^\circ \cdot \sin 60^\circ \\ &= 0 \cdot \frac{1}{2} - (-1) \cdot \frac{\sqrt{3}}{2} \\ &= \frac{\sqrt{3}}{2} \\ &= \cos 30^\circ \end{aligned}$$

Yanıt / Answer A

4. $x \in \left[0, \frac{\pi}{2}\right], \tan x \cdot \sin 2x - \cos 2x = 0 \Rightarrow x = ?$

- A) $\frac{\pi}{2}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{5}$ E) $\frac{\pi}{6}$

(YÖS 1990)

Çözüm / Solution:

$$\begin{aligned} \tan x \cdot \sin 2x - \cos 2x &= 0 \\ \frac{\sin x}{\cos x} \cdot 2 \cdot \sin x \cdot \cos x - (1 - 2 \sin^2 x) &= 0 \\ 2 \sin^2 x - 1 + 2 \sin^2 x &= 0 \\ 4 \sin^2 x = 1 &\Rightarrow \sin x = \frac{1}{2} \\ \Rightarrow x = 30^\circ &= \frac{\pi}{6} \end{aligned}$$

Yanıt / Answer E

5. $\frac{\sin 135^\circ \cdot \cos 30^\circ}{\cos(-30^\circ)} = ?$

- A) $\frac{\sqrt{2}}{2}$ B) $\frac{\sqrt{2}}{3}$ C) $\frac{\sqrt{3}}{3}$
D) $-\frac{\sqrt{2}}{2}$ E) $-\frac{\sqrt{3}}{2}$

(YÖS 1991)

Çözüm / Solution:

$$\begin{aligned}
 \sin 135^\circ &= \sin (180^\circ - 45^\circ) \\
 &= \sin 180^\circ \cdot \cos 45^\circ - \cos 180^\circ \cdot \sin 45^\circ \\
 &= 0 \cdot \frac{\sqrt{2}}{2} - (-1) \cdot \frac{\sqrt{2}}{2} \\
 &= \frac{\sqrt{2}}{2} \\
 \cos (-30^\circ) &= \cos 30^\circ \\
 \frac{\sin 135^\circ \cdot \cos 30^\circ}{\cos (-30^\circ)} &= \frac{\frac{\sqrt{2}}{2} \cdot \cos 30^\circ}{\cos 30^\circ} \\
 &= \frac{\sqrt{2}}{2}
 \end{aligned}$$

Yanıt / Answer A

6. $\frac{\sin 10x}{\sin 2x} - \frac{\cos 10x}{\cos 2x} = ?$

- A) $\cos 2x$ B) $\cos x$ C) $2\cos x$
D) $4\cos 4x$ E) $3\cos 2x$

(YÖS 1995)

Çözüm / Solution:

$$\begin{aligned}
 \frac{\sin 10x}{\sin 2x} - \frac{\cos 10x}{\cos 2x} &= \frac{\sin 10x \cdot \cos 2x - \cos 10x \cdot \sin 2x}{\sin 2x \cdot \cos 2x} \\
 &= \frac{\sin(10x - 2x)}{\sin 2x \cdot \cos 2x} \\
 &= \frac{\sin 8x}{\sin 2x \cdot \cos 2x} \\
 &= \frac{2 \cdot \sin 4x \cdot \cos 4x}{\sin 2x \cdot \cos 2x} \\
 &= \frac{2 \cdot 2 \cdot \sin 2x \cdot \cos 2x \cdot \cos 4x}{\sin 2x \cdot \cos 2x} \\
 &= 4 \cdot \cos 4x
 \end{aligned}$$

Yanıt / Answer D

7. $[AC] \perp [BC]$

$[BD] \perp [CD]$

$\sin \alpha = \frac{5}{13}$

$\tan \theta = \frac{4}{3}$

$\cos(\widehat{ABD}) = ?$

A) $-\frac{4}{3}$

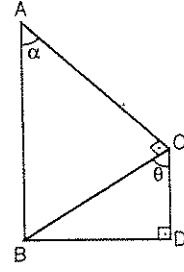
B) $-\frac{9}{13}$

C) $-\frac{13}{18}$

D) $-\frac{16}{65}$

E) $-\frac{24}{65}$

(YÖS 1998)



Çözüm / Solution:

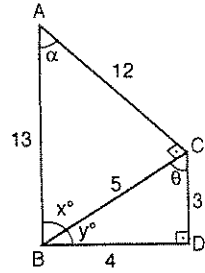
$m(\widehat{ABC}) = x$

$m(\widehat{CBD}) = y$

$|AB| = 13, |BC| = 5$

$|BD| = 4, |CD| = 3$

$|AC| = 12$



$\cos(x + y) = \cos(\widehat{ABD}) = \cos x \cdot \cos y - \sin x \cdot \sin y$

$$\begin{aligned}
 &= \frac{5}{13} \cdot \frac{4}{5} - \frac{12}{13} \cdot \frac{3}{5} \\
 &= \frac{20}{65} - \frac{36}{65} \\
 &= -\frac{16}{65}
 \end{aligned}$$

Yanıt / Answer D

8. $\sin x - \cos x = \frac{1 - \sqrt{3}}{2}$

$\Rightarrow \sin 2x = ?$

A) $\frac{\sqrt{3}-2}{2}$

B) $\frac{\sqrt{3}+2}{2}$

C) $\frac{2-\sqrt{3}}{2}$

D) $\frac{\sqrt{3}}{2}$

E) $\frac{\sqrt{3}}{4}$

(YÖS 2002)

Çözüm / Solution:

$$(\sin x - \cos x)^2 = \left(\frac{1 - \sqrt{3}}{2}\right)^2$$

$$\frac{\sin^2 x + \cos^2 x}{1} - \frac{2 \sin x \cos x}{\sin 2x} = \frac{4 - 2\sqrt{3}}{4}$$

$$1 - \sin 2x = \frac{4 - 2\sqrt{3}}{4}$$

$$\sin 2x = \frac{\sqrt{3}}{2}$$

Yanıt / Answer D

9. $\sin 2x = 0,4 \Rightarrow (\sin x - \cos x)^2 = ?$

- A) 0,5 B) 0,6 C) 0,8 D) 1 E) 2

(YÖS 2003)

Çözüm / Solution:

$$\begin{aligned} (\sin x - \cos x)^2 &= \sin^2 x + \cos^2 x - 2 \sin x \cdot \cos x \\ &= 1 - \sin 2x \\ &= 1 - 0,4 \\ &= 0,6 \end{aligned}$$

Yanıt / Answer B

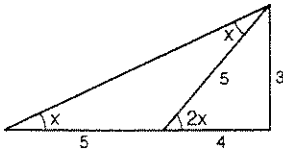
10. $\tan 2x = \frac{3}{4}$

$\cot x = ?$

- A) 0 B) 1 C) 2 D) 3 E) 4

(YÖS 2005)

Çözüm / Solution:



$$\tan 2x = \frac{3}{4}$$

$$\Rightarrow \cot x = \frac{9}{3} = 3$$

Yanıt / Answer D

11.

$$\frac{\sin 30^\circ}{\sin 10^\circ} - \frac{\cos 30^\circ}{\cos 10^\circ} = ?$$

- A) 0 B) 1 C) 2 D) 3 E) 4

(YÖS 2006)

Çözüm / Solution:

$$\frac{\sin 30}{\sin 10} - \frac{\cos 30}{\cos 10} = \frac{\sin 30 \cdot \cos 10 - \cos 30 \cdot \sin 10}{\sin 10 \cdot \cos 10}$$

$$= \frac{\sin(30 - 10)}{\frac{\sin 20}{2}} = 2$$

Yanıt / Answer C

12. $\frac{\sin(\arctan(\sqrt{3}))}{\cos 60^\circ} = ?$

- A) $-\frac{\sqrt{2}}{2}$ B) $-\frac{1}{2}$ C) $\frac{\sqrt{2}}{2}$
D) $\sqrt{3}$ E) 3

(YÖS 2007)

Çözüm / Solution:

$$\arctan \sqrt{3} = \frac{\pi}{3} = 60^\circ$$

$$\Rightarrow \frac{\sin(\arctan(\sqrt{3}))}{\cos 60^\circ} = \frac{\sin 60^\circ}{\cos 60^\circ} = \tan 60^\circ = \sqrt{3}$$

Yanıt / Answer D

1. $\cos(180^\circ - x) = ?$

Yanıt / Answer : $-\cos x$

2. $\sin 150^\circ, \cos 560^\circ, \tan 342^\circ \Rightarrow ?, ?, ?$

Yanıt / Answer : $+, -, -$

3. $\frac{1 - \cos^2 x}{\sec^2 x - 1} = ?$

Yanıt / Answer : $\cos^2 x$

4. $\frac{1}{1 + \tan^2 x} + \frac{1}{1 + \cot^2 x} = ?$

Yanıt / Answer : 1

5. $\frac{\sin x - \sin y}{\cos x + \cos y} = ?$

Yanıt / Answer : $\tan\left(\frac{x-y}{2}\right)$

6. $\frac{\cos 300^\circ + \sin 120^\circ}{\tan 45^\circ + \tan 60^\circ} = ?$

Yanıt / Answer : $\frac{1}{2}$

7. $\frac{\cos 210^\circ - \sin 420^\circ}{\sin(-240^\circ) + \cos(-30^\circ)} = ?$

Yanıt / Answer : -1

8. $\frac{3\pi}{2} < \alpha < 2\pi$

$\sin \alpha = -\frac{5}{13} \Rightarrow \cos \alpha = ?$

Yanıt / Answer : $\frac{12}{13}$

9. $\frac{\cos 3a}{\sin a} + \frac{\sin 3a}{\cos a} = ?$

Yanıt / Answer : $2\cot 2a$

10. $0 < x < \pi$,
 $\sin^2 x + \sin x - 2 = 0 \Rightarrow x = ?$

Yanıt / Answer : $\frac{\pi}{2}$

11. $\cos\left(\arcsin\left(\frac{1}{2}\right)\right) = ?$

Yanıt / Answer : $\frac{\sqrt{3}}{2}$

12. $A = \sin 10^\circ + \tan 40^\circ \cdot \cos 10^\circ \Rightarrow A = ?$

Yanıt / Answer : 1

13. $\arccos x = 12 \Rightarrow \sin 66 = ?$

Yanıt / Answer : $2x^2 - 1$

14. $A = \sin(3\arctan\sqrt{3} + 2\arccos\frac{1}{2}) \Rightarrow A = ?$

Yanıt / Answer : $-\frac{\sqrt{3}}{2}$

15. $\tan x = \operatorname{cosec} 2x$ denkleminin $(0, 2\pi)$ aralığında kaç kökü vardır?

Yanıt / Answer : 4

16. $\sin 163^\circ, \sec 115^\circ, \operatorname{cosec} 220^\circ, \operatorname{tg} 300^\circ \Rightarrow ?, ?, ?, ?$

Yanıt / Answer : +, -, -, -

$$17. \quad x = \frac{\pi}{20} \Rightarrow \frac{\cos 4x - \cos 8x}{\cos 8x - \cos 4x} = ?$$

Yanıt / Answer : -1

$$18. \quad 192\sqrt{3} \cdot \sin \frac{\pi}{48} \cdot \cos \frac{\pi}{48} \cdot \cos \frac{\pi}{24} \cdot \cos \frac{\pi}{12} \cdot \cos \frac{\pi}{6} \cdot \cos \frac{\pi}{3} = ?$$

Yanıt / Answer : 9

$$19. \quad \arctan \frac{1}{3} + \arctan \frac{1}{2} = ?$$

Yanıt / Answer : $\frac{\pi}{4}$

$$20. \quad \tan x = \frac{3}{5} \Rightarrow \sin 2x = ?$$

Yanıt / Answer : $\frac{15}{17}$

$$21. \quad \sin 50^\circ = m \\ \Rightarrow \cot 680^\circ + \tan 230^\circ - 2 \cdot \sin(-50) = ?$$

Yanıt / Answer : 2m

$$22. \quad \sqrt{\cos^2 x} - \sqrt{1 - \sin^2 x} = ?$$

Yanıt / Answer : 0

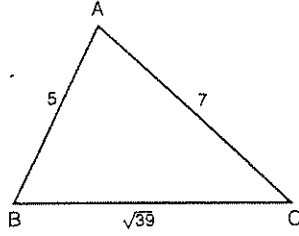
$$23. \quad \frac{(\sin x + \cos x)^2}{1 + \sin 2x}$$

Yanıt / Answer : 1

$$24. \quad 2\sin 5^\circ \cdot \cos 5^\circ \cdot \cos 10^\circ = a \Rightarrow \cos 40^\circ = ?$$

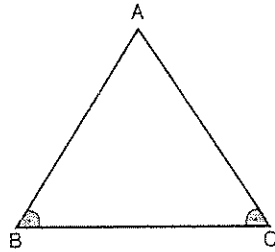
Yanıt / Answer : $1 - 8a^2$

25. $|AB| = 5$ cm,
 $|AC| = 7$ cm,
 $|BC| = \sqrt{39}$ cm
 $\Rightarrow m(\widehat{BAC}) = ?$



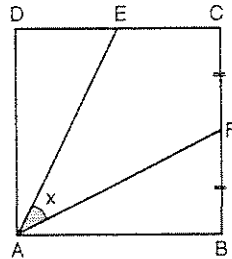
Yanıt / Answer : 60°

26. ABC üçgeni ikizkenardır.
ABC is an isosceles triangle.
 $m(\widehat{B}) = m(\widehat{C})$,
 $\tan A = \frac{5}{12} \Rightarrow \cos \widehat{C} = ?$



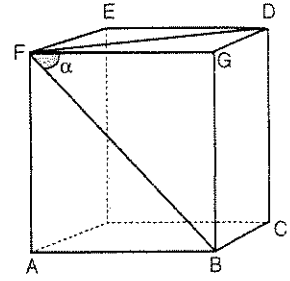
Yanıt / Answer : $\frac{1}{\sqrt{26}}$

27. ABCD bir karedir.
ABCD is a square.
 $|BF| = |FC|$,
 $|EC| = 2|DE|$
 $\Rightarrow m(\widehat{EAF}) = x = ?$



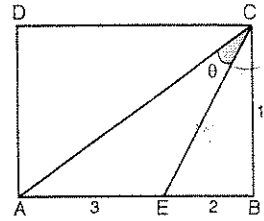
Yanıt / Answer : $\frac{\pi}{4}$

28. $m(\widehat{BFD}) = \alpha$
 $\Rightarrow \sin \alpha = ?$



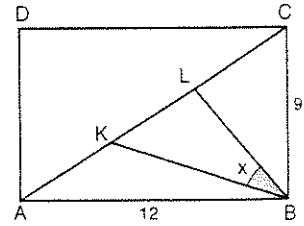
Yanıt / Answer : $\frac{\sqrt{3}}{2}$

29. ABCD bir dikdörtgendir.
ABCD is a rectangle.
 $|AE| = 3$ cm,
 $|EB| = 2$ cm,
 $|BC| = 1$ cm
 $\Rightarrow \tan \theta = ?$



Yanıt / Answer : $\frac{3}{11}$

30. ABCD bir dikdörtgendir.
ABCD is a rectangle.
 $|AB| = 12$ cm,
 $|BC| = 9$ cm,
 $|AK| = |KL| = |LC|$,
 $m(\widehat{KBL}) = x$
 $\Rightarrow \cot x = ?$



Yanıt / Answer : $\frac{25}{18}$

1. $120^\circ = k \cdot \pi \Rightarrow k = ?$

- A)
- $\frac{1}{6}$
- B)
- $\frac{1}{3}$
- C)
- $\frac{2}{3}$
- D)
- $\frac{1}{4}$
- E)
- $\frac{3}{2}$

2.
$$\left. \begin{array}{l} \alpha = \frac{3\pi}{4} \\ \alpha = x^\circ \end{array} \right\} \Rightarrow x = ?$$

- A)
- 45°
- B)
- 90°
- C)
- 120°
- D)
- 135°
- E)
- 180°

3. $780^\circ = \alpha + 360 \cdot k \Rightarrow \alpha = ?$

- A)
- 20°
- B)
- 30°
- C)
- 40°
- D)
- 60°
- E)
- 120°

4. $-1650^\circ = \alpha + 360 \cdot k \Rightarrow \alpha = ?$

- A) 210 B) 180 C) 160 D) 150 E) 140

5. $\frac{27\pi}{5} = \alpha + 2k\pi \Rightarrow \alpha = ?$

- A)
- $\frac{2\pi}{5}$
- B)
- $\frac{4\pi}{5}$
- C)
- π
- D)
- $\frac{6\pi}{5}$
- E)
- $\frac{7\pi}{5}$

6. $\frac{-13\pi}{2} = \alpha + 2k\pi \Rightarrow \alpha = ?$

- A)
- $\frac{\pi}{2}$
- B)
- $\frac{3\pi}{2}$
- C)
- π
- D)
- $\frac{5\pi}{2}$
- E)
- $\frac{3\pi}{4}$

7.
$$\left. \begin{array}{l} A = 27^\circ 42' 38'' \\ B = 36^\circ 38' 23'' \end{array} \right\} \Rightarrow A + B = ?$$

- A)
- $64^\circ 21' 1''$
- B)
- $65^\circ 21' 1''$
- C)
- $63^\circ 21' 1''$
-
- D)
- $64^\circ 21' 11''$
- E)
- $64^\circ 22' 1''$

8. $47238'' = x^\circ y' z'' \Rightarrow z = ?$

- A) 8 B) 12 C) 18 D) 24 E) 28

9. $\frac{\sin x}{\operatorname{cosec} x} + \frac{\cos x}{\sec x} = ?$

- A)
- $2\sin x$
- B)
- $\sin x + \cos x$
- C) 0
-
- D) 1 E)
- $\sin x - \cos x$

10. $\frac{1-\sin^2 x}{\cos^2 x} + \tan x \cdot \cot x = ?$

- A) 0 B) 1 C) $\sin x$ D) $\cos x$ E) 2

11. $\frac{1}{\cos^2 x} - \frac{1}{\cot^2 x} = ?$

- A) $\tan x$ B) $\cot x$ C) $\sin x$
D) $\cos x$ E) 1

12. $\frac{\sin^3 x + \sin x \cdot \cos^2 x}{\cos x} = ?$

- A) 1 B) $\sin x$ C) $\cos x$
D) $\tan x$ E) $\cot x$

13. $(1 + \sin x) \cdot \left(1 - \frac{1}{\sin x}\right) \cdot \tan x = ?$

- A) $\cos x$ B) $-\cos x$ C) $\sin x$
D) $-\cot x$ E) $\tan x$

14. $\left(\frac{\cos x}{1-\sin^2 x} - \frac{\sin x}{1-\cos^2 x}\right) : \left(\frac{\sin x - \cos x}{\sin x}\right) = ?$

- A) $\sec x$ B) $\operatorname{cosec} x$ C) $-\sec x$
D) $-\operatorname{cosec} x$ E) $\cos x$

15. $\cot x + \frac{\sin x}{1+\cos x} = ?$

- A) $\sin x$ B) $\cos x$ C) $\tan x$
D) $\operatorname{cosec} x$ E) $\sec x$

16. $\frac{\sin^2 x}{1+\cos x} + \cos x = ?$

- A) $1 + 2\cos x$ B) $2\sin x$ C) $2\cos x$
D) 1 E) -1

17. $\frac{1+\cos x}{\sin x} + \frac{\sin x}{1+\cos x} = ?$

- A) $\sec x$ B) $\operatorname{cosec} x$ C) $\sin x$
D) $\cos x$ E) $2\operatorname{cosec} x$

18. $\sin x + \cos x = \frac{3}{4} \Rightarrow \sin x \cdot \cos x = ?$

- A) $-\frac{7}{16}$ B) $-\frac{7}{8}$ C) $-\frac{7}{32}$ D) $\frac{9}{16}$ E) $\frac{1}{2}$

Yanıtlar / Answers

1. C	2. D	3. D	4. D	5. E	6. B
7. A	8. C	9. D	10. E	11. E	12. D
13. B	14. A	15. D	16. D	17. E	18. C

1. $3\sin x - 4\cos y = A \Rightarrow \max(A) = ?$

- A) -1 B) 0 C) 2 D) 3 E) 7

2. $\frac{\sin 30^\circ + \cos 30^\circ}{\tan 45^\circ + \cot 30^\circ} = ?$

- A) 1 B)
- $\frac{1}{2}$
- C)
- $\frac{\sqrt{3}}{2}$
- D)
- $\frac{\sqrt{2}}{2}$
- E)
- $\frac{1+\sqrt{3}}{2}$

3. $a = \sin 70^\circ, b = \cos 140^\circ, c = \tan 310^\circ, d = \sin 182^\circ$

$\Rightarrow a, b, c, d = ?$

- A) +, -, -, + B) +, -, -, - C) +, +, -, -
-
- D) +, -, +, - E) -, +, +, +

4. $\sin(210^\circ) + \tan(135^\circ) = ?$

- A)
- $\frac{3}{2}$
- B)
- $1 - \frac{\sqrt{2}}{2}$
- C)
- $-\frac{1}{2}$
- D)
- $-\frac{3}{2}$
- E)
- $\frac{1-\sqrt{3}}{2}$

5. $\sin 750^\circ + \cos 1680^\circ = ?$

- A)
- $\frac{1-\sqrt{2}}{2}$
- B)
- $\frac{1+\sqrt{2}}{2}$
- C)
- $\frac{1-\sqrt{3}}{2}$
-
- D)
- $\frac{1+\sqrt{3}}{2}$
- E) 0

6. $\left. \begin{array}{l} a = \sin 70^\circ \\ b = \cos 40^\circ \\ c = \sin 125^\circ \\ d = \cos(-70^\circ) \end{array} \right\} \Rightarrow ? < ? < ? < ?$

- A)
- $a < b < c < d$
- B)
- $d < b < c < a$
-
- C)
- $d < c < b < a$
- D)
- $c < d < b < a$
-
- E)
- $c < d < a < b$

7. $\left. \begin{array}{l} a = \cot(70^\circ) \\ b = \tan(-140^\circ) \\ c = \tan 35^\circ \\ d = \tan 280^\circ \end{array} \right\} \Rightarrow ? < ? < ? < ?$

- A)
- $b < a < c < d$
- B)
- $a < c < b < d$
-
- C)
- $d < a < c < b$
- D)
- $a < d < b < c$
-
- E)
- $d < a < b < c$

8. $\left. \begin{array}{l} a = \tan 62^\circ \\ b = \sin 110^\circ \\ c = \cos 15^\circ \\ d = \cot 30^\circ \end{array} \right\} \Rightarrow ? < ? < ? < ?$

- A)
- $b < c < d < a$
- B)
- $b < c < a < d$
-
- C)
- $d < a < c < b$
- D)
- $b < a < c < d$
-
- E)
- $d < b < c < a$

9. Aşağıdakilerden kaç tanesi doğrudur?

How many of the followings are correct?

- I. $\cos(-\alpha) = -\cos\alpha$
- II. $\sin(\pi - \alpha) = \sin\alpha$
- III. $\tan(\pi + \alpha) = -\tan\alpha$
- IV. $\cot\left(\frac{3\pi}{2} - \alpha\right) = \cot\alpha$
- V. $\sin\left(\frac{\pi}{2} - \alpha\right) = \cos\alpha$
- VI. $\cos\left(\alpha - \frac{\pi}{2}\right) = -\cos\alpha$
- VII. $\tan(-\alpha) = -\tan\alpha$
- VIII. $\cos(\alpha - 2\pi) = \cos\alpha$
- IX. $\cot(\alpha - \pi) = \cot\alpha$

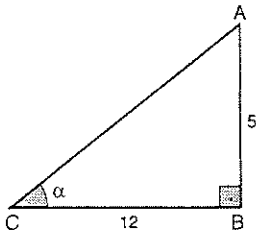
A) 4 B) 5 C) 6 D) 7 E) 8

10. $x > 0^\circ$

$$\sin(3x - 16^\circ) = \cos(4x - 6) \Rightarrow x = ?$$

A) 8 B) 12 C) 16 D) 20 E) 24

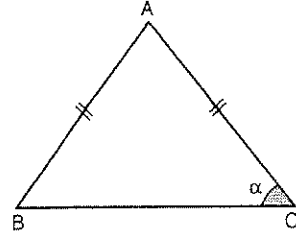
11.



$$-\sin\alpha - \cos(180 - \alpha) + \tan(90 + \alpha) = ?$$

A) $\frac{121}{5}$ B) $\frac{121}{65}$ C) $-\frac{121}{5}$ D) $-\frac{121}{65}$ E) 1

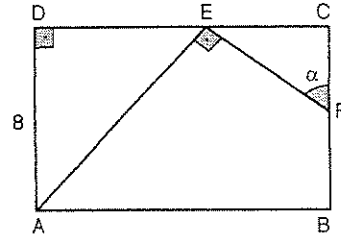
12.



$$\left. \begin{array}{l} |AB| = |AC| = 13 \\ |BC| = 24 \end{array} \right\} \Rightarrow \sin\alpha = ?$$

A) $\frac{5}{13}$ B) $\frac{12}{13}$ C) $\frac{3}{4}$ D) $\frac{3}{5}$ E) $\frac{4}{5}$

13.



ABCD bir dikdörtgendir. ABCD is a rectangle.

$$m(\widehat{EFC}) = \alpha,$$

$$m(\widehat{AEF}) = 90^\circ,$$

$$|AD| = 8 \text{ cm},$$

$$|DE| = 15 \text{ cm} \Rightarrow \sin(\alpha) = ?$$

A) $\frac{8}{17}$ B) $\frac{15}{17}$ C) $\frac{5}{13}$ D) $\frac{3}{5}$ E) $\frac{4}{5}$

Yanıtlar / Answers

1. E	2. B	3. B	4. D	5. E	6. B
7. C	8. A	9. A	10. C	11. D	12. A
13. A					

1. $\frac{\pi}{2} < x < \pi$

$$\sin x = \frac{1}{4} \Rightarrow \cos x - \cot x = ?$$

- A) $-\frac{3\sqrt{15}}{4}$ B) $-\frac{\sqrt{15}}{4}$ C) $\frac{\sqrt{15}}{4}$
 D) $\frac{3\sqrt{15}}{4}$ E) $\frac{5\sqrt{15}}{2}$

2. $0 < \alpha < \frac{\pi}{2}$

$$3\sin \alpha - 4\cos \alpha = 0 \Rightarrow \tan \alpha + \sin \alpha = ?$$

- A) $\frac{7}{15}$ B) $\frac{8}{15}$ C) $\frac{13}{15}$ D) $\frac{26}{15}$ E) $\frac{32}{15}$

3. $0 < \alpha < \frac{\pi}{2}$

$$\frac{2\sin \alpha + 3\cos \alpha}{5\sin \alpha - 2\cos \alpha} = \frac{2}{3} \Rightarrow \tan \alpha = ?$$

- A) $\frac{13}{4}$ B) $\frac{4}{13}$ C) $\frac{5}{12}$ D) $\frac{12}{5}$ E) $\frac{13}{12}$

4. $\pi < \alpha < \frac{3\pi}{2}$

$$\frac{3\sin \alpha - 2\cos \alpha}{5\sin \alpha - 2\cos \alpha} = \frac{1}{2} \Rightarrow \sin \alpha = ?$$

- A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{5}}$ C) $\frac{2}{\sqrt{5}}$ D) $-\frac{1}{\sqrt{5}}$ E) $-\frac{2}{\sqrt{5}}$

5. $\cos 105^\circ = ?$

- A) $\frac{\sqrt{6}-2}{4}$ B) $\frac{\sqrt{6}+2}{4}$ C) $\frac{\sqrt{6}+\sqrt{2}}{2}$
 D) $\frac{\sqrt{6}-\sqrt{2}}{4}$ E) $\frac{\sqrt{2}-\sqrt{6}}{4}$

6. $\sin 72^\circ \cdot \cos 18^\circ + \sin 18^\circ \cdot \cos 72^\circ = ?$

- A) 0 B) $\frac{1}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{3}}{2}$ E) 1

7. $\frac{\cos 40^\circ}{\sin 10^\circ} - \frac{\sin 40^\circ}{\cos 10^\circ} = ?$

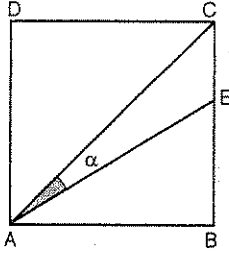
- A) $2\cos 20^\circ$ B) $2\sin 20^\circ$ C) $\sin 10^\circ$
 D) $4\sin 20^\circ$ E) $4\cos 20^\circ$

8. $x + y = \frac{\pi}{6}$

$$\Rightarrow (\cos x + \sin y)^2 + (\cos y + \sin x)^2 = ?$$

- A) $\frac{1}{2}$ B) 1 C) $\frac{\sqrt{3}}{2} + 1$ D) 3 E) 4

9.

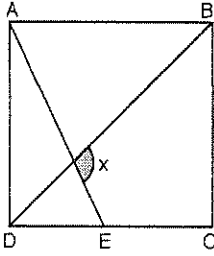


ABCD bir karedir. / ABCD is a square.

$$2 \cdot |CE| = |EB| \Rightarrow \tan \alpha = ?$$

- A) $\frac{5}{9}$ B) $\frac{1}{5}$ C) $\frac{9}{5}$ D) 5 E) $\frac{3}{5}$

10.

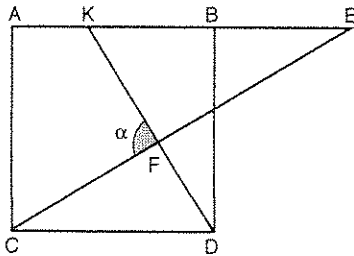


ABCD bir karedir. / ABCD is a square.

$$3 \cdot |DC| = 4 \cdot |DE| \Rightarrow \sin x = ?$$

- A) $\frac{7\sqrt{2}}{5}$ B) $\frac{2\sqrt{2}}{5}$ C) $\frac{\sqrt{2}}{10}$ D) $\frac{\sqrt{3}}{15}$ E) $\frac{7\sqrt{2}}{10}$

11.



ABCD bir karedir. / ABCD is a square.

$$2|KB| = 6|KA| = 3|BE|$$

$$m(\widehat{KFD}) = \alpha \Rightarrow \cot \alpha = ?$$

- A) 18 B) 16 C) 1 D) $\frac{1}{16}$ E) $\frac{1}{18}$

12.

$$\left. \begin{aligned} a &= \cos 12^\circ \cdot \cos 18^\circ \\ b &= \cos 78^\circ \cdot \cos 72^\circ \end{aligned} \right\} \Rightarrow a - b = ?$$

- A) $-\frac{1}{2}$ B) $-\frac{\sqrt{3}}{2}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{2}}{2}$ E) $\frac{\sqrt{3}}{2}$

13. $\cos 16^\circ = a \Rightarrow \sin 58^\circ = ?$

- A) $\sqrt{\frac{1-a}{2}}$ B) $\sqrt{\frac{1+a}{2}}$ C) $2a^2 - 1$
D) $1 - 2a^2$ E) $\frac{a-1}{2}$

14. $\cos 40^\circ = 2m \Rightarrow \sin(12,5^\circ) \cdot \cos(12,5^\circ) \cdot (\sin 65^\circ) = ?$

- A) 8m B) 4m C) 2m D) $\frac{m}{2}$ E) $\frac{m}{4}$

15. $A = \sin \frac{\pi}{12} \cdot \cos \frac{\pi}{12} \cdot \cos \frac{\pi}{6} \Rightarrow A^2 = ?$

- A) $\frac{1}{64}$ B) $\frac{1}{32}$ C) $\frac{4}{3}$ D) $\frac{3}{64}$ E) 1

16. $\sin x - \cos x = \frac{3}{4} \Rightarrow \sin 2x = ?$

- A) $-\frac{7}{32}$ B) $-\frac{7}{16}$ C) $\frac{7}{16}$ D) $\frac{7}{32}$ E) $\frac{9}{16}$

Yanıtlar / Answers

1. A	2. E	3. A	4. E	5. E	6. E
7. E	8. D	9. B	10. E	11. E	12. E
13. C	14. D	15. D	16. C		

1. $\cos(\alpha) \neq ?$

- A) $\cos(-\alpha)$ B) $\sin(90^\circ - \alpha)$
 C) $\cos(2\pi - \alpha)$ D) $-\cos(\pi - \alpha)$
 E) $\sin(270^\circ - \alpha)$

2. $\frac{\cos 150^\circ - \sin 150^\circ}{\cos(-330^\circ) - \sin(-750^\circ)} = ?$

- A) $-\frac{\sqrt{3}}{3}$ B) -1 C) $\frac{\sqrt{3}}{3}$ D) 1 E) 3

3. $\frac{\pi}{2} < x < \pi$

$\sin x = \frac{3}{5} \Rightarrow \tan x - \cos x = ?$

- A) $-\frac{1}{10}$ B) $-\frac{1}{20}$ C) 0 D) $\frac{1}{10}$ E) $\frac{1}{20}$

4. $\frac{3\pi}{2} < x < 2\pi$

$\frac{6\cos x + 7\sin x}{3\cos x - \sin x} = -2 \Rightarrow \cos x = ?$

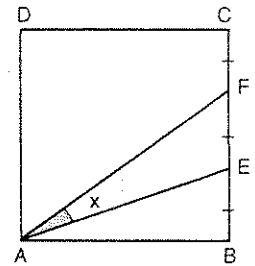
- A) $-\frac{5}{13}$ B) $-\frac{12}{13}$ C) 0 D) $\frac{12}{13}$ E) $\frac{5}{13}$

5. $x + 2y = \frac{\pi}{2}$

$\Rightarrow \sin(2x + 2y) - \sin(2y) = ?$

- A) $\sin 2x$ B) $2\sin x$ C) $\sin(x + y)$
 D) 0 E) $\cos(x + y)$

6. ABCD bir karedir.
 ABCD is a square.
 $|CF| = |FE| = |EB|$
 $\Rightarrow \tan(x) = ?$



- A) $\frac{1}{7}$ B) $\frac{1}{8}$ C) $\frac{1}{9}$ D) $\frac{1}{11}$ E) $\frac{3}{11}$

7. $x + y = \frac{\pi}{6}$

$\sin x + \cos y = A$

$\cos x + \sin y = B$

$\Rightarrow A^2 + B^2 = ?$

- A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{3}$ C) 1 D) 2 E) 3

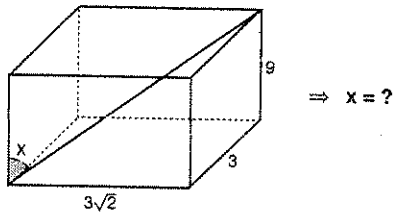
8. $\sin^2 \frac{\pi}{8} = ?$

- A) $\frac{2 - \sqrt{2}}{4}$ B) $\frac{\sqrt{2}}{4}$ C) $\frac{\sqrt{2}}{2}$
 D) $\sqrt{2} - 1$ E) $\frac{2\sqrt{2} + 1}{2}$

9. $\sin(2a) = \frac{3}{5} \Rightarrow \tan(a) = ?$

- A) $\frac{1}{\sqrt{10}}$ B) $\frac{1}{3\sqrt{10}}$ C) $\sqrt{10}$ D) $\frac{1}{3}$ E) 3

10.



- A) 30° B) 45° C) 60° D) 75° E) 90°

11. $\tan x + \cot x = 3 \Rightarrow \tan^2 x + \cot^2 x = ?$

- A) 7 B) 8 C) 9 D) 10 E) 11

12. $0 < x < \frac{\pi}{2}$

$\cot x - \tan x = 2$

$\Rightarrow \cot x + \tan x = ?$

- A) 8 B) $3\sqrt{2}$ C) $2\sqrt{2}$ D) 2 E) $\sqrt{3}$

13. $\frac{\sin^4 x + 2\cos^2 x - 1}{\cos^4 x} = ?$

- A) $\cos 2x$ B) $\sin 2x$ C) 1
D) $-\cos 2x$ E) $\sin 2x$

14. $0 < x < 90^\circ$

$\frac{1 + \cos 2x}{\sin 2x} = \sqrt{3} \Rightarrow x = ?$

- A) 15° B) 30° C) 45° D) 60° E) 75°

15. $\frac{1}{\cos 80^\circ} - \frac{\sqrt{3}}{\sin 80^\circ} = A \Rightarrow A = ?$

- A) 4 B) 3 C) 2 D) 1 E) $\frac{1}{4}$

16. $\sin^4 a - \cos^4 a = ?$

- A) $\cos 2a$ B) $\sin 2a$ C) 1
D) $-\sin 2a$ E) $-\cos 2a$

Yanıtlar / Answers

1. E	2. B	3. E	4. E	5. D	6. E
7. E	8. A	9. D	10. A	11. A	12. C
13. C	14. B	15. A	16. E		

1. $\cos 40^\circ + \cos 80^\circ = ?$

- A) $\cos 20^\circ$ B) $-\cos 20^\circ$ C) $2\cos 20^\circ$
D) $2\sin 20^\circ$ E) $-2\cos 20^\circ$

2. $\sin 75^\circ + \sin 15^\circ = ?$

- A) $\frac{1}{4}$ B) $\frac{\sqrt{6}}{4}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{6}}{2}$ E) $\frac{\sqrt{6}-2}{4}$

3. $16x = \pi$

$$\Rightarrow \frac{\sin 12x - \sin 8x}{\cos 16x + \cos 4x} = ?$$

- A) -2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 1 E) 2

4. $\frac{\sin 75^\circ + \cos 5^\circ}{\cos 75^\circ - \sin 5^\circ} = ?$

- A) $\tan 10^\circ$ B) 1 C) $\cot 10^\circ$ D) $\cot 5^\circ$ E) $\tan 5^\circ$

5. $\tan 15^\circ + \cot 15^\circ = ?$

- A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{6}-\sqrt{2}}{4}$ C) $\frac{\sqrt{3}+1}{2}$ D) 2 E) 4

6. $\frac{\cos 37^\circ + \sin 37^\circ}{\cos 37^\circ - \sin 37^\circ} = ?$

- A) $\sin 8^\circ$ B) $\cos 8^\circ$ C) $\tan 8^\circ$ D) $\cot 8^\circ$ E) $\sec 8^\circ$

7. $x = \frac{\pi}{17} \Rightarrow \frac{\cos 14x + \cos 12x}{\cos 3x + \cos 5x} = ?$

- A) -2 B) $-\frac{3}{2}$ C) -1 D) 0 E) 1

8. $\frac{\sin 2x + \sin 3x + \sin 4x}{\cos 2x + \cos 3x + \cos 4x} = ?$

- A) $\sin 3x$ B) $\cos 3x$ C) $\tan 3x$
D) $\cot 3x$ E) 1

9. $x = \frac{\pi}{12} \Rightarrow \frac{\sin 3x + \sin 11x}{\sin 5x \cdot \cos 4x} = ?$

- A) -2 B) -1 C) 1 D) $\frac{1}{2}$ E) 2

10. $\frac{\sin 5a + \sin 4a + \sin 3a}{\sin 9a + \sin 8a + \sin 7a} = ?$

- A) $\sin 4a$ B) $\sin 8a$ C) $\tan 2a$
D) $\frac{\sec 4a}{2}$ E) $\frac{\sec 8a}{2}$

11. $16 \cdot \sin 10^\circ \cdot \sin 30^\circ \cdot \sin 50^\circ \cdot \sin 70^\circ = ?$

- A) 8 B) 4 C) 2 D) 1 E) $\frac{1}{2}$

12. $\cos 106^\circ \cdot \sin 14^\circ + \sin 30^\circ \cdot \cos 2^\circ = ?$

- A) $-\frac{1}{4}$ B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{4}$

13. $\frac{\sin 10x - \sin 6x - \sin 2x}{\sin 9x - \sin 7x - \sin x} = ?$

- A) $2\sin x$ B) $2\tan 4x$ C) $\cot 3x$
D) $2\cos x$ E) $\sin 2x$

14. $\frac{\sin 82^\circ + \sin 22^\circ}{\sin 68^\circ - \sin 8^\circ} = ?$

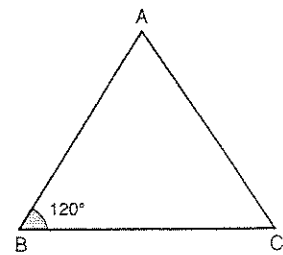
- A) $-\sqrt{3}$ B) $-\frac{\sqrt{3}}{3}$ C) $\frac{\sqrt{3}}{3}$ D) $\frac{\sqrt{3}}{2}$ E) $\sqrt{3}$

15. $x = \frac{\pi}{30} \Rightarrow \frac{\cos 14x + \cos 6x}{\cos 4x} = ?$

- A) $\frac{1}{2}$ B) $-\frac{1}{2}$ C) 1 D) -1 E) $\frac{\sqrt{3}}{4}$

16. $m(\widehat{B}) = 120^\circ$

$\Rightarrow \frac{\sin \widehat{A} + \sin \widehat{C}}{\cos \widehat{A} + \cos \widehat{C}} = ?$

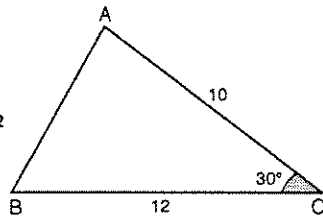


- A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{3}}{4}$ C) $\frac{\sqrt{3}}{3}$ D) $\sqrt{3}$ E) $\frac{1}{2}$

Yanıtlar / Answers

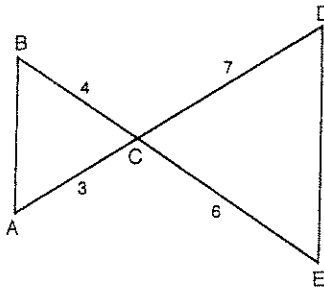
1. A	2. D	3. D	4. D	5. E	6. D
7. C	8. C	9. E	10. D	11. D	12. E
13. D	14. E	15. C	16. C		

1. $|AC| = 10$ cm,
 $|BC| = 12$ cm,
 $m(\widehat{ACB}) = 30^\circ$
 $\Rightarrow A(\triangle ABC) = ? \text{ cm}^2$



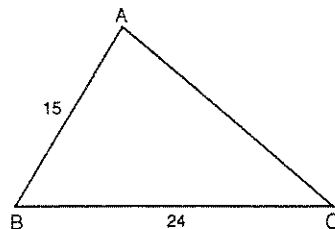
- A) 120 B) 60 C) $30\sqrt{3}$ D) 30 E) $15\sqrt{2}$

2. $|BC| = 4$ cm,
 $|AC| = 3$ cm,
 $|CD| = 7$ cm,
 $|CE| = 6$ cm,
 $A(\triangle ABC) = 4 \text{ cm}^2$
 $\Rightarrow A(\triangle CDE) = ? \text{ cm}^2$



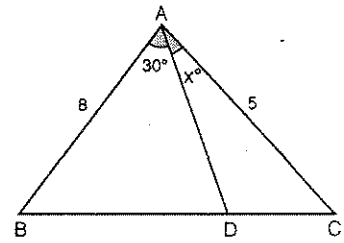
- A) 28 B) $14\sqrt{2}$ C) 14 D) $7\sqrt{2}$ E) $7\sqrt{3}$

3. $m(\widehat{A}) = 2m(\widehat{C})$,
 $|AB| = 15$ cm,
 $|BC| = 24$ cm
 $\Rightarrow \tan(\widehat{C}) = ?$



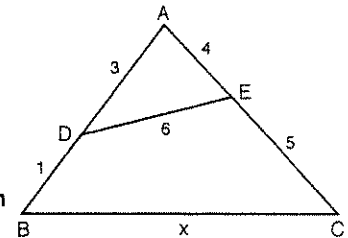
- A) $\frac{4}{5}$ B) $\frac{3}{5}$ C) $\frac{4}{3}$ D) $\frac{3}{4}$ E) $\frac{\sqrt{2}}{2}$

4. $m(\widehat{BAD}) = 30^\circ$,
 $|AB| = 8$ cm,
 $|AC| = 5$ cm,
 $|BD| = 2|DC|$,
 $m(\widehat{DAC}) = x$
 $\Rightarrow \sin x = ?$



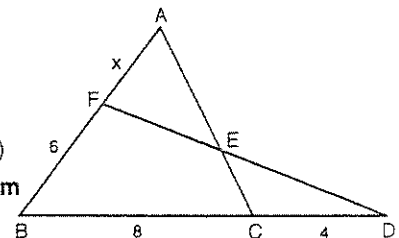
- A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{5}$ D) $\frac{\sqrt{21}}{5}$ E) $\frac{2}{5}$

5. $|AD| = 3$ cm,
 $|AE| = 4$ cm,
 $|DE| = 6$ cm,
 $|DB| = 1$ cm,
 $|EC| = 5$ cm
 $\Rightarrow |BC| = x = ? \text{ cm}$



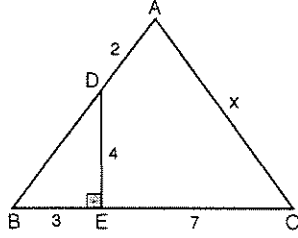
- A) $\frac{\sqrt{91}}{2}$ B) $\frac{3\sqrt{10}}{2}$ C) $2\sqrt{22}$ D) $\sqrt{22}$ E) $\sqrt{130}$

6. $|FB| = 6$ cm,
 $|BC| = 8$ cm,
 $|CD| = 4$ cm,
 $A(\triangle AFE) = A(\triangle ECD)$
 $\Rightarrow |AF| = x = ? \text{ cm}$



- A) 2 B) $\frac{5}{2}$ C) 3 D) $\frac{7}{2}$ E) 4

7. $[BC] \perp [DE]$,
 $|AD| = 2$ cm,
 $|DE| = 4$ cm,
 $|BE| = 3$ cm,
 $|EC| = 7$ cm
 $\Rightarrow |AC| = x = ?$ cm



- A) $4\sqrt{2}$ B) $3\sqrt{7}$ C) $4\sqrt{7}$ D) $4\sqrt{11}$ E) $\sqrt{65}$

8. $\arccos 5x = \frac{\pi}{3} \Rightarrow x = ?$

- A) $\frac{\sqrt{3}}{10}$ B) $\frac{\sqrt{2}}{10}$ C) $\frac{1}{10}$ D) $\frac{\sqrt{2}}{5}$ E) $\frac{\sqrt{3}}{5}$

9. $\sin\left(\arcsin\frac{\sqrt{3}}{2}\right) + \cos\left(\arccos\frac{1}{2}\right) = ?$

- A) 1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}-1}{2}$ D) $\frac{\sqrt{3}+1}{2}$ E) $\sqrt{3}$

10. $\arccos\left(-\frac{3}{5}\right) = \alpha \Rightarrow \sin \alpha = ?$

- A) $-\frac{3}{5}$ B) $-\frac{4}{5}$ C) $\frac{3}{4}$ D) $\frac{3}{5}$ E) $\frac{4}{5}$

11. $\sin\left(\frac{\pi}{2} - \arccos\frac{1}{3}\right) = ?$

- A) $\frac{1}{3}$ B) $\frac{2\sqrt{2}}{3}$ C) $\frac{1}{2\sqrt{2}}$ D) $-\frac{1}{3}$ E) $-\frac{2\sqrt{2}}{3}$

12. $\sin\left(2\arcsin\left(\frac{4}{5}\right)\right) = ?$

- A) $\frac{12}{25}$ B) $\frac{16}{25}$ C) $\frac{18}{25}$ D) $\frac{24}{25}$ E) 1

13. $\sin\left(\arccos\frac{3}{5} + \arcsin\frac{5}{13}\right) = ?$

- A) $\frac{43}{65}$ B) $\frac{44}{65}$ C) $\frac{9}{13}$ D) $\frac{46}{65}$ E) $\frac{63}{65}$

14. $\tan\left(\arctan\frac{5}{12} - \arcsin\frac{\sqrt{10}}{10}\right) = ?$

- A) $\frac{7}{12}$ B) $\frac{5}{13}$ C) $\frac{3}{41}$ D) $\frac{41}{36}$ E) $\frac{14}{31}$

15. $\arctan\frac{1}{3} + \arctan 3 = ?$

- A) 150° B) 120° C) 90° D) 60° E) 45°

Yanıtlar / Answers

1. D	2. C	3. D	4. E	5. E	6. C
7. E	8. C	9. D	10. E	11. A	12. D
13. E	14. C	15. C			

1. $\tan x = \frac{\sqrt{3}}{3} \Rightarrow \text{ÇK(SS)} = ?$

- A) $\left\{x \in \mathbb{R}, x = \frac{\pi}{3} + 2k\pi \vee x = \frac{2\pi}{3} + 2k\pi\right\}$
 B) $\left\{x \in \mathbb{R}, x = \frac{\pi}{6} + 2k\pi \vee x = \frac{5\pi}{6} + 2k\pi\right\}$
 C) $\left\{x \in \mathbb{R}, x = \frac{\pi}{6} + 2k\pi \vee x = \frac{11\pi}{6} + 2k\pi\right\}$
 D) $\left\{x \in \mathbb{R}, x = \frac{\pi}{6} + k\pi\right\}$
 E) $\left\{x \in \mathbb{R}, x = \frac{\pi}{3} + k\pi\right\}$

2. $\sin 4x = \frac{\sqrt{3}}{2} \Rightarrow \text{ÇK(SS)} = ?$

- A) $\left\{x \in \mathbb{R}, x = \frac{\pi}{12} + \frac{k\pi}{4} \vee x = \frac{11\pi}{12} + \frac{k\pi}{4}\right\}$
 B) $\left\{x \in \mathbb{R}, x = \frac{\pi}{12} + \frac{k\pi}{2} \vee x = \frac{\pi}{6} + \frac{k\pi}{2}\right\}$
 C) $\left\{x \in \mathbb{R}, x = \frac{\pi}{6} + \frac{k\pi}{2} \vee x = \frac{5\pi}{6} + \frac{k\pi}{2}\right\}$
 D) $\left\{x \in \mathbb{R}, x = \frac{\pi}{24} + \frac{k\pi}{2} \vee x = \frac{23\pi}{24} + \frac{k\pi}{2}\right\}$
 E) $\left\{x \in \mathbb{R}, x = \frac{\pi}{24} + \frac{k\pi}{4} \vee x = \frac{23\pi}{24} + \frac{k\pi}{4}\right\}$

3. $\tan\left(3x - \frac{\pi}{3}\right) = \cot\left(\frac{\pi}{4} - x\right) \Rightarrow \text{ÇK(SS)} = ?$

- A) $\left\{x: x = \frac{7\pi}{24} + \frac{k\pi}{2}\right\}$ B) $\left\{x: x = \frac{7\pi}{48} + \frac{k\pi}{4}\right\}$
 C) $\left\{x: x = \frac{5\pi}{12} + \frac{k\pi}{6}\right\}$ D) $\left\{x: x = \frac{5\pi}{24} + \frac{k\pi}{2}\right\}$
 E) $\left\{x: x = \frac{\pi}{12} + \frac{k\pi}{3}\right\}$

4. $x \in (0, 2\pi)$

$\sqrt{3} \sin x = 3 \cos x \Rightarrow \text{ÇK(SS)} = ?$

- A) $\left\{\frac{\pi}{3}\right\}$ B) $\left\{\frac{\pi}{6}\right\}$ C) $\left\{\frac{\pi}{3}, \frac{4\pi}{3}\right\}$ D) $\left\{\frac{\pi}{6}, \frac{7\pi}{6}\right\}$ E) $\emptyset$

5. $x \in (0, \pi)$

$2\cos^2 x - 5\cos x - 3 = 0 \Rightarrow x = ?$

- A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$ D) $\frac{5\pi}{6}$ E) $\frac{2\pi}{3}$

6. $x \in \left(0, \frac{\pi}{2}\right)$

$2\sin x \cdot \cos x = \cos 40^\circ \Rightarrow \text{ÇK(SS)} = ?$

- A) $\{20^\circ\}$ B) $\{20^\circ, 70^\circ\}$ C) $\{40^\circ, 70^\circ\}$
 D) $\{25^\circ\}$ E) $\{65^\circ, 25^\circ\}$

7. $x \in (0, \pi)$

$\frac{3 - 4\sin^2 x}{\cos^2 x} = 2 \Rightarrow \text{ÇK(SS)} = ?$

- A) $\left\{\frac{\pi}{4}\right\}$ B) $\left\{\frac{\pi}{2}, \frac{3\pi}{4}\right\}$ C) $\left\{\frac{\pi}{4}\right\}$
 D) $\left\{\frac{\pi}{4}, \frac{3\pi}{4}\right\}$ E) $\left\{\frac{\pi}{2}\right\}$

8. $x \in \left(\frac{\pi}{2}, \pi\right)$

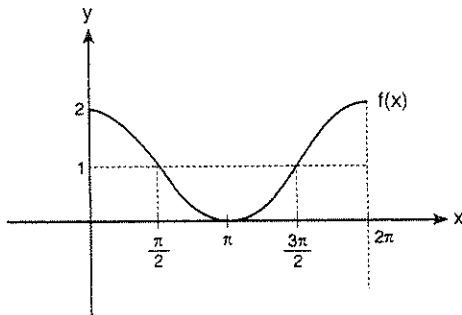
$1 - \cos 2x - \sin x = 0 \Rightarrow x = ?$

- A) 0 B) $\frac{\pi}{3}$ C) $\frac{\pi}{6}$ D) $\frac{5\pi}{6}$ E) π

9. $\cos^2 x - \sin^2 x = \sin 3x \Rightarrow \text{ÇK(SS)} = ?$

- A) $\left\{x \mid x = \frac{\pi}{2} + 2k\pi \vee x = \frac{\pi}{10} + \frac{2k\pi}{5}\right\}$
 B) $\left\{x \mid x = \frac{\pi}{3} + 2k\pi \vee x = \frac{3\pi}{10} + \frac{2k\pi}{5}\right\}$
 C) $\left\{x \mid x = \frac{\pi}{4} + 2k\pi \vee x = \frac{3\pi}{10} + \frac{2k\pi}{5}\right\}$
 D) $\left\{x \mid x = \frac{\pi}{5} + 2k\pi \vee x = \frac{\pi}{10} + \frac{2k\pi}{5}\right\}$
 E) $\left\{x \mid x = \frac{\pi}{6} + 2k\pi \vee x = \frac{\pi}{10} + \frac{k\pi}{5}\right\}$

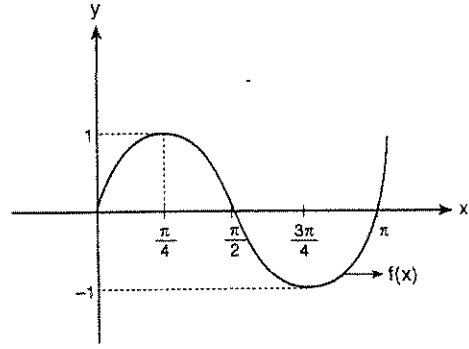
10.



$\Rightarrow f(x) = ?$

- A) $f(x) = 1 - \cos x$ B) $f(x) = 1 - \sin x$
 C) $f(x) = \cos x$ D) $f(x) = 1 + \sin x$
 E) $f(x) = 1 + \cos x$

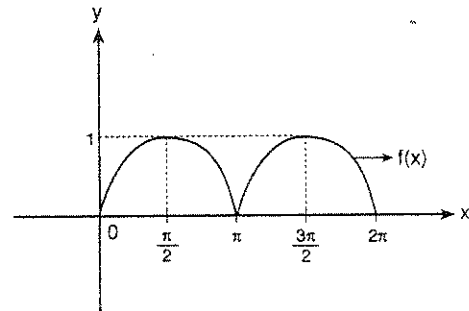
11.



$\Rightarrow f(x) = ?$

- A) $f(x) = \sin x$ B) $f(x) = 2 \cdot \sin x$
 C) $f(x) = 2 \cos x$ D) $f(x) = \sin 2x$
 E) $f(x) = \cos 2x$

12.



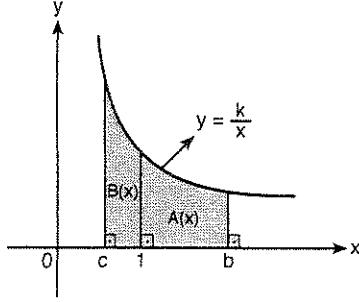
$\Rightarrow f(x) = ?$

- A) $f(x) = \sin x$ B) $f(x) = \sin x + \cos x$
 C) $f(x) = |\cos x|$ D) $f(x) = |\sin x|$
 E) $f(x) = |\sin x + \cos x|$

Yanıtlar / Answers

1. D	2. B	3. A	4. C	5. E	6. E
7. D	8. D	9. A	10. E	11. D	12. D

Tanım / Definition:



$$A(a) = 1, \quad A(x) = \log_a b, \quad B(x) = -\log_a c$$



LOGARİTMANIN ÖZELLİKLERİ
PROPERTIES of LOGARITHM

1. Yalnız pozitif sayıların logaritması vardır.
Only positive numbers have logarithms.
2. $\log_a 1 = 0$
3. $\log_a a = 1$
4. $y = \log_a x \Leftrightarrow x = a^y$
5. $a^{\log_a x} = x$
6. $\log_a (x \cdot y) = \log_a x + \log_a y$
7. $\log_a \frac{x}{y} = \log_a x - \log_a y$
8. $\log_a x^n = n \cdot \log_a x$
9. $\log_a x = \frac{\log_b x}{\log_b a}$ taban değiştirme /
changing the base of a logarithm
10. $\log_a x = \frac{1}{\log_x a}$
11. $\log_{a^n} x^m = \frac{m}{n} \log_a x$
12. $\log_{10} x = \log x$
13. $\log_e x = \ln x, \quad e \approx 2,7$
14. $\text{Colog } a = -\log a$
15. $\log_a b \cdot \log_b c \cdot \log_c d \cdot \log_d f = \log_a f$

Örnek / Example:

$$A = \frac{2}{\log_{11} 385} + \frac{2}{\log_7 385} + \frac{2}{\log_5 385} \Rightarrow A = ?$$

Çözüm / Solution:

$$A = 2 \left(\frac{1}{\frac{1}{\log_{385} 11}} + \frac{1}{\frac{1}{\log_{385} 7}} + \frac{1}{\frac{1}{\log_{385} 5}} \right)$$

$$A = 2 (\log_{385} 11 + \log_{385} 7 + \log_{385} 5)$$

$$\begin{aligned} A &= 2 (\log_{385} 11 \cdot 7 \cdot 5) = 2 \log_{385} 385 \\ &= 2 \cdot 1 \\ &= 2 \end{aligned}$$

Örnek / Example:

$$2^{\log x} = 3^{\log 2} \Rightarrow x = ?$$

Çözüm / Solution:

$$\log 2^{\log x} = \log (3^{\log 2})$$

$$\log x \cdot \log 2 = \log 2 \cdot \log 3$$

$$\log x = \log 3 \Rightarrow x = 3$$

Örnek / Example:

$$x^{\ln x} - e^6 \cdot x = 0 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$x^{\ln x} - e^6 \cdot x = 0 \Rightarrow x^{\ln x} = e^6 \cdot x$$

$$\ln(x^{\ln x}) = \ln e^6 \cdot x$$

$$\ln^2 x - \ln x - 6 = 0$$

$$(\ln x - 3) \cdot (\ln x + 2) = 0$$

$$\ln x - 3 = 0 \wedge \ln x = -2$$

$$x = e^3 \wedge x = e^{-2}$$

$$\text{ÇK(SS)} = \left\{ \frac{1}{e^2}, e^3 \right\}$$

Örnek / Example:

$$\log_2(x-1) + \log_2(3x+1) = 6 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$x-1 > 0 \Rightarrow x > 1, \quad 3x+1 > 0 \Rightarrow x > -\frac{1}{3}$$

$$x > 1$$

$$\log_2(x-1) \cdot \log_2(3x+1) = 6$$

$$(x-1) \cdot \log_2(3x+1) = 2^6$$

$$3x^2 - 2x - 65 = 0$$

$$(3x+13)(x-5) = 0 \Rightarrow x = -\frac{13}{5}$$

$$\text{ÇK(SS)} = \{5\}$$

Örnek / Example:

$$e^x - 12e^{-x} - 4 = 0 \Rightarrow \text{ÇK(SS)} = ?$$

Çözüm / Solution:

$$e^x - \frac{12}{e^x} - 4 = 0 \Rightarrow e^{2x} - 4e^x - 12 = 0$$

$$e^x = t \Rightarrow t^2 - 4t - 12 = 0$$

$$(t+2) \cdot (t-6) = 0$$

$$t+2=0 \Rightarrow t=-2, \quad t-6=0 \Rightarrow t=6$$

$$e^x = -2 \Rightarrow \varphi_1 = \emptyset$$

$$e^x = 6 \Rightarrow x = \ln 6$$

$$\text{ÇK(SS)} = \{\ln 6\}$$

Örnek / Example:

$$\left. \begin{array}{l} \log xy^3 = 3 \\ \log \frac{x^2}{y} = -8 \end{array} \right\} \Rightarrow (x, y) = (?, ?)$$

Çözüm / Solution:

$$\left. \begin{array}{l} \log x + 3 \log y = 3 \\ 2 \log x - \log y = -8 \end{array} \right\} \Rightarrow \begin{array}{l} \log x + 3 \log y = 3 \\ 6 \log x - 3 \log y = -24 \end{array}$$

$$7 \log x = -21 \Rightarrow \log x = -3 \Rightarrow x = 10^{-3}$$

$$-3 + 3 \log y = 3 \Rightarrow \log y = 2 \Rightarrow y = 10^2$$

$$(x, y) = (10^{-3}, 10^2)$$



LOGARİTMA FONKSİYONUNUN TERSİ INVERSE of a LOGARITHM FUNCTION

$$f(x) = \log_a x \Leftrightarrow f^{-1}(x) = a^x$$

Örnek / Example:

$$f(x) = \log_5(3x-2) \Rightarrow f^{-1}(2) = ?$$

Çözüm / Solution:

$$f(x) = \log_5(3x-2)$$

$$\Rightarrow y = \log_5(3x-2)$$

$$5^y = 3x-2$$

$$\Rightarrow x = \frac{5^y + 2}{3}$$

$$f^{-1}(x) = \frac{5^x + 2}{3}$$

$$\Rightarrow f^{-1}(2) = \frac{5^2 + 2}{3} = \frac{27}{3} = 9$$

$$f^{-1}(2) = 9$$

Örnek / Example:

$$f(x) = 2^{5x-3} - 28 \Rightarrow f^{-1}(100) = ?$$

Çözüm / Solution:

$$y = 2^{5x-3} - 28$$

$$2^{5x-3} = y + 28$$

$$5x - 3 = \log_2(y + 28)$$

$$x = \frac{\log_2(y + 28) + 3}{5}$$

$$f^{-1}(x) = \frac{\log_2 \cdot 8(x + 28)}{5}$$

$$f^{-1}(100) = \frac{\log_2 2^3 \cdot 128}{5}$$

$$= \frac{\log_2 2^{10}}{5} = \frac{10}{5} = 2$$

ÇÖZÜMLÜ TEST / TEST WITH SOLUTIONS

1. $\log 2 = m \Rightarrow \log 320 = ?$

- A) $4m$ B) $5m$ C) $5m - 1$
D) $5m + 1$ E) m^5

Çözüm / Solution:

$$\begin{aligned}\log 2 &= m \\ \log 320 &= \log(32 \cdot 10) = \log 32 + \log 10 \\ &= \log 2^5 + 1 \\ &= 5 \log 2 + 1 \\ &= 5m + 1\end{aligned}$$

Yanıt / Answer D

2. $\log 2 = m$ ve (and) $\log 3 = n \Rightarrow \log 720 = ?$

- A) $3n - 1$ B) $2n + 1$ C) $2m + 3n + 1$
D) $2n + 1$ E) m^5

Çözüm / Solution:

$$\begin{aligned}\log 2 &= m, \log 3 = n \\ \log 720 &= \log(72 \cdot 10) = \log 72 + \log 10 \\ &= \log(9 \cdot 8) + 1 \\ &= \log 9 + \log 8 + 1 \\ &= \log 3^2 + \log 2^3 + 1 \\ &= 2 \log 3 + 3 \log 2 + 1 \\ &= 2n + 3m + 1\end{aligned}$$

Yanıt / Answer C

3. $\log_2 3 \cdot \log_3 5 \cdot \log_5 9 \cdot \log_9 16 = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution:

$$\begin{aligned}\log_2 3 \cdot \log_3 5 \cdot \log_5 9 \cdot \log_9 16 \\ &= \frac{\log 3}{\log 2} \cdot \frac{\log 5}{\log 3} \cdot \frac{\log 3^2}{\log 5} \cdot \frac{\log 2^4}{\log 3^2} \\ &= \frac{\log 3}{\log 2} \cdot \frac{\log 5}{\log 3} \cdot \frac{2 \log 3}{\log 5} \cdot \frac{4 \log 2}{2 \log 3} = 4\end{aligned}$$

Yanıt / Answer D

4. $\log_3 5 = a \Rightarrow \log_5 9 = ?$

- A) a B) $2a$ C) $\frac{2}{a}$ D) $-a$ E) $-\frac{a}{2}$

Çözüm / Solution:

$$\begin{aligned}\log_3 5 &= a \\ \log_5 9 &= \frac{1}{\log_9 5} = \frac{1}{\log_{3^2} 5} = \frac{2}{\log_3 5} = \frac{2}{a}\end{aligned}$$

Yanıt / Answer C

5. $\log_2 (x - 5) = 4 \Rightarrow x = ?$

- A) 21 B) 16 C) 8 D) -8 E) -16

Çözüm / Solution:

$$\begin{aligned}\log_2 (x - 5) &= 4 \Rightarrow x - 5 = 2^4 \\ x - 5 &= 16 \\ x &= 16 + 5 \\ x &= 21\end{aligned}$$

Yanıt / Answer A

6. $\log_3 x - \log_3 (x - 1) = 2 \Rightarrow x = ?$

- A) $\frac{8}{9}$ B) $\frac{9}{8}$ C) $\frac{2}{3}$ D) $-\frac{2}{3}$ E) $-\frac{9}{10}$

Çözüm / Solution:

$$\begin{aligned}\log_3 x - \log_3 (x - 1) &= 2 \Rightarrow \log_3 \left(\frac{x}{x-1} \right) = 2 \\ \frac{x}{x-1} &= 3^2 \Rightarrow \frac{x}{x-1} = 9 \\ x &= 9x - 9 \\ x &= \frac{9}{8}\end{aligned}$$

Yanıt / Answer B

7. $e^{2x} - 4e^x - 32 = 0 \Rightarrow x = ?$

- A) $\ln 2$ B) $3\ln 2$ C) $\ln 6$
D) $2\ln 6$ E) $4\ln 6$

Çözüm / Solution:

$$\begin{aligned} e^{2x} - 4e^x - 32 &= 0 \\ (e^x - 8) \cdot (e^x + 4) &= 0 \\ e^x - 8 &= 0 \\ e^x &= 8 \\ x &= \ln 8 \\ x &= 3 \cdot \ln 2 \end{aligned}$$

Yanıt / Answer B

8. $\log_6 2 = a \Rightarrow \log_6 9 = ?$

- A) $3a$ B) $6 - 3a$ C) $-2a$
D) $2a - 4$ E) $2 - 2a$

Çözüm / Solution:

$$\begin{aligned} \log_6 2 &= \frac{1}{\log_2 6} = \frac{1}{\log_2 3 + 1} = a \\ \log_2 3 &= \frac{1}{a} - 1 = \frac{1-a}{a} \Rightarrow \log_3 2 = \frac{a}{1-a} \\ \log_6 9 &= \frac{1}{\log_9 6} = \frac{2}{\log_3 6} = \frac{2}{\log_3 2 + 1} \\ &= \frac{2}{\frac{a}{1-a} + 1} \\ &= \frac{2}{\frac{1}{1-a}} \\ &= 2(1-a) \\ &= 2 - 2a \end{aligned}$$

Yanıt / Answer E

9. $\log_2 (\log_3 x) = 3 \Rightarrow x = ?$

- A) 2^3 B) 2^6 C) 3^8 D) 3^6 E) -3^4

Çözüm / Solution:

$$\begin{aligned} \log_2 (\log_3 x) &= 3 \Rightarrow \log_3 x = 2^3 \\ \log_3 x &= 8 \\ x &= 3^8 \end{aligned}$$

Yanıt - Answer C

10. $\log 20 + 2\log 2 - 3\log 2 = ?$

- A) -2 B) -1 C) 0 D) 1 E) 2

Çözüm / Solution:

$$\begin{aligned} \log 20 + 2\log 2 - 3\log 2 &= \log 20 + \log 2^2 - \log 2^3 \\ &= \log \left(\frac{20 \cdot 4}{8} \right) \\ &= \log 10 \\ &= 1 \end{aligned}$$

Yanıt / Answer D

11. $\log_3 x + \log_9 x = 5 \Rightarrow x = ?$

- A) $\sqrt[3]{3}$ B) $3\sqrt[3]{9}$ C) $3\sqrt[3]{3}$
D) $27\sqrt{3}$ E) $27\sqrt[3]{3}$

Çözüm / Solution:

$$\begin{aligned} \log_3 x + \log_9 x &= \log_3 x + \frac{1}{2} \log_3 x \\ &= \log_3 x + \log_3 x^{\frac{1}{2}} \\ &= \log_3 (x \cdot x^{\frac{1}{2}}) \\ &= \log_3 x^{\frac{3}{2}} = 5 \\ x^{\frac{3}{2}} &= 3^5 \\ x &= 3^{\frac{10}{3}} \\ x &= 27\sqrt[3]{3} \end{aligned}$$

Yanıt / Answer E

12. $\log_2 (x+2) + \log_2 (x-2) = 3 \Rightarrow x = ?$

- A) $-2\sqrt{3}$ B) $\frac{\sqrt{3}}{2}$ C) $\sqrt{3}$
D) $2\sqrt{3}$ E) $2\sqrt[3]{3}$

Çözüm / Solution:

$$\begin{aligned} \log_2 (x+2) + \log_2 (x-2) &= 3 \\ \log_2 [(x+2) \cdot (x-2)] &= 3 \\ \log_2 (x^2 - 4) &= 3 \\ x^2 - 4 &= 2^3 \\ x^2 &= 12 \\ x &= 2\sqrt{3} \end{aligned}$$

Yanıt / Answer D

13. $\log 3 = a, \log 4 = b \Rightarrow \log_5 36 = ?$

- A) $2a + 4b$ B) $\frac{5-2a}{b+1}$ C) $\frac{a+2b}{b-a}$
D) $\frac{2b+4a}{2-b}$ E) $\frac{4a-2b}{a-2}$

Çözüm / Solution:

$$\begin{aligned}\log 3 &= a \\ \log 4 &= \log 2^2 = 2\log 2 = b \\ \log 2 &= \frac{b}{2} \\ \log_5 36 &= \frac{\log 36}{\log 5} = \frac{2\log 6}{\log \frac{10}{2}} \\ &= \frac{2(\log 2 + \log 3)}{\log 10 - \log 2} \\ &= \frac{2\left(\frac{b}{2} + a\right)}{1 - \frac{b}{2}} \\ &= \frac{2(b + 2a)}{2 - b} \\ &= \frac{2b + 4a}{2 - b}\end{aligned}$$

Yanıt / Answer D

14. $\log x^2 + \log x^3 = 15 \Rightarrow x = ?$

- A) 10^3 B) 10^5 C) 6^{15} D) 2^{15} E) 3^{10}

Çözüm / Solution:

$$\begin{aligned}\log x^2 + \log x^3 &= \log(x^2 \cdot x^3) = \log x^5 \\ \log x^5 &= 15 \Rightarrow x^5 = 10^{15} \\ x &= 10^3\end{aligned}$$

Yanıt / Answer A

15. $3^{\log_3 8} + 2^{\log_2 9} = 5^{\log_5 x} \Rightarrow x = ?$

- A) 17 B) 16 C) 15 D) 14 E) 13

Çözüm / Solution:

$$\left. \begin{aligned}3^{\log_3 8} &= 8 \\ 2^{\log_2 9} &= 9 \\ 5^{\log_5 x} &= x\end{aligned} \right\} \Rightarrow \begin{aligned}8 + 9 &= x \\ 17 &= x\end{aligned}$$

Yanıt / Answer A

16. $\ln \sqrt{x} + \ln \sqrt{x^3} = 1 \Rightarrow x = ?$

- A) $2e$ B) e^2 C) $\sqrt{e}$ D) $\sqrt[3]{e}$ E) e

Çözüm / Solution:

$$\begin{aligned}\ln \sqrt{x} + \ln \sqrt{x^3} &= \ln(\sqrt{x} \cdot \sqrt{x^3}) \\ &= \ln \sqrt{x^4} \\ &= \ln x^2 = 1 \\ x^2 &= e \\ x &= \sqrt{e}\end{aligned}$$

Yanıt / Answer C

17. $3^x + 3^{x+2} = 10 \Rightarrow x = ?$

- A) 0 B) $\frac{1}{2}$ C) 1 D) $\frac{3}{2}$ E) $\frac{5}{2}$

Çözüm / Solution:

$$\begin{aligned}3^x + 3^{x+2} &= 3^x + 3^x \cdot 3^2 = 10 \\ 3^x(1 + 9) &= 10 \\ 3^x &= 1 \\ x &= 0\end{aligned}$$

Yanıt / Answer A

18. $\log 2 = 0,30103 \Rightarrow \log 125 = ?$

- A) $-2,69897$ B) $2,69897$ C) $2,60206$
D) $2,09691$ E) $-2,6991$

Çözüm / Solution:

$$\begin{aligned}\log 2 &= 0,30103 \\ \log 125 &= \log \frac{1000}{8} = \log 10^3 - \log 2^3 \\ &= 3 - 3\log 2 \\ &= 3 - 3 \cdot (0,30103) \\ &= 2,09691\end{aligned}$$

Yanıt / Answer D

19. $\log x = 2,48135 \Rightarrow \text{colog } x = ?$

- A) $\bar{3}, 51865$ B) $e^{2,48135}$ C) $\frac{1}{2,48135}$
D) $\bar{2}, 48135$ E) $\bar{3}, 48135$

Çözüm / Solution:

$$\begin{aligned}\log x &= 2,48135 \\ \text{colog } x &= -\log x \\ &= -2,48135 \\ &= -2 - 0,48135 \\ &= -2 - 1 + 1 - 0,48135 \\ &= -3 + 0,51865 \\ &= \bar{3}, 51865\end{aligned}$$

Yanıt / Answer A

20. $\log_3(x^2 - 6x) > 3$ eşitsizliğinin çözüm kümesi aşağıdakilerden hangisidir?

What is the solution set for this inequality?

- A) $x < 3$ B) $x < -3$ C) $x < -3$
 $x > 9$ $x > 9$ $x > -9$
D) $x > 3$ E) $x > -3$
 $x < 9$ $x < -9$

Çözüm / Solution:

$$\begin{aligned}\log_3(x^2 - 6x) &> 3 \\ x^2 - 6x &> 3^3 \text{ ve (and) } x^2 - 6x > 0 \\ x^2 - 6x &> 27 & x(x-6) > 0 \\ x^2 - 6x - 27 &> 0 & x_1 = 0 \\ (x-9)(x+3) &> 0 & x_2 = 6 \\ & & x_1 = 9 \\ & & x_2 = -3\end{aligned}$$

		-3	9				0	6	
$x^2 - 6x - 27$	+		-	+	$x^2 - 6x$	+	-	+	
	$x < -3$			$x > 9$		$x < 0$		$x > 6$	

İki koşulun kesişimi / intersection of the condition:

$$x < -3, x > 9$$

Yanıt / Answer B

YÖS SORULARI / YÖS QUESTIONS

1. $x > 1$

$$(x-1)^{(x+3)} = 1$$

$$\Rightarrow \log_x \frac{1}{2} = ?$$

- A) -1 B) -2 C) -3 D) -4 E) -5

(YÖS 1990)

Çözüm / Solution:

$$x-1=1 \Rightarrow x=2$$

Logaritmanın tabanı negatif olamaz.

Base of a logarithm can not be negative.

$$x=2$$

$$\begin{aligned}\log_2 \frac{1}{2} &= -\log_2 2 \\ &= -1\end{aligned}$$

Yanıt / Answer A

2. $\log_3 5 = x \Rightarrow \log_3 15 = ?$

- A) $2x+2$ B) $2x+1$ C) $2x-1$
D) $x-2$ E) $x+1$

(YÖS 1991)

Çözüm / Solution:

$$\log_3 5 = x$$

$$\log_3 15 = \log_3 (3 \cdot 5) = \log_3 3 + \log_3 5 = 1 + x$$

Yanıt / Answer E

3. $\log_{10} 5 = x \Rightarrow 5^{1-x} = ?$

- A) 2^x B) 2^{-x} C) 2^{x-1}
D) 2^{1-x} E) 2^{x+1}

(YÖS 1992)

Çözüm / Solution:

$$\log_{10} 5 = x \Rightarrow 5 = 10^x$$

$$5 = 5^x \cdot 2^x$$

$$\frac{5}{5^x} = 2^x$$

$$5^{1-x} = \frac{5}{5^x} = 2^x$$

Yanıt / Answer A

4. $\frac{1}{\log_4 16} + \frac{1}{\log_2 4} = ?$

- A) 1 B) 2 C) 3 D) $\frac{1}{2}$ E) $\frac{1}{3}$

(YÖS 1995)

Çözüm / Solution:

$$\frac{1}{\log_4 16} + \frac{1}{\log_2 4} = \frac{1}{\log_{2^2} 2^4} + \frac{1}{\log_2 2^2} \\ = \frac{1}{2} + \frac{1}{2} = 1$$

Yanıt / Answer A

5. $\left. \begin{array}{l} \log_a x = 30 \\ \log_b x = 70 \end{array} \right\} \Rightarrow \log_{ab} x = ?$

- A) 15 B) 21 C) 28 D) 35 E) 50

(YÖS 1997)

Çözüm / Solution:

$$\log_{ab} x = \frac{1}{\log_x ab} = \frac{1}{\log_x a + \log_x b} \\ = \frac{1}{\frac{1}{30} + \frac{1}{70}} = \frac{1}{\frac{10}{210}} = 21$$

Yanıt / Answer B

6. $x \in \mathbb{R}^+, x \neq 1$
 $\log_3 (3 \cdot \log_x (2x - 3)) = 1$
 $\Rightarrow x = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

(YÖS 1998)

Çözüm / Solution:

$$\log_3 (3 \cdot \log_x (2x - 3)) = 1 \\ 3 \cdot \log_x (2x - 3) = 3^1 = 3 \\ \log_x (2x - 3) = 1 \\ 2x - 3 = x \\ x = 3$$

Yanıt / Answer C

7. $\left. \begin{array}{l} \log 3 = x \\ \log 5 = y \\ \log 7 = z \end{array} \right\} \Rightarrow \log \frac{225}{7} = ?$

- A) $x + y - z$ B) $x + 2y - z$ C) $2x + y - z$
D) $2x + 2y - z$ E) $2x + 2y + z$

(YÖS 2004)

Çözüm / Solution:

$$\log \frac{225}{7} = \log 225 - \log 7 = \log(3^2 \cdot 5^2) - \log 7 \\ = 2 \cdot \log 3 + 2 \cdot \log 5 - \log 7 = 2x + 2y - z$$

Yanıt / Answer D

8. $\log_2 3 = a \Rightarrow \log_3 48 = ?$

- A) $\frac{a-2}{a}$ B) $\frac{a-3}{a}$ C) $\frac{a+2}{a}$
D) $\frac{a+3}{a}$ E) $\frac{a+4}{a}$

(YÖS 2005)

Çözüm / Solution:

$$\log_3 48 = \frac{\log_2 48}{\log_2 3} = \frac{\log_2 2^4 + \log_2 3}{\log_2 3} = \frac{4+a}{a}$$

Yanıt / Answer E

9. $x \neq -3$
 $\log_{10} (4x + 12) + \log_{10} \frac{250}{x+3} = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

(YÖS 2005)

Çözüm / Solution:

$$\log_{10} (4x + 12) \cdot \frac{250}{x+3} = \log_{10} 1000 = 3 \cdot \log_{10} 10 = 3$$

Yanıt / Answer C

10. $\log 2 = a$
 $\log 3 = b$
 $\Rightarrow \log_{20} 24 = ?$

- A) $\frac{a+b}{a-1}$ B) $\frac{a+3b}{a-1}$ C) $\frac{3a+b}{a+1}$
D) $\frac{a+3b}{a+1}$ E) $\frac{3a+2b}{a+1}$

(YÖS 2006)

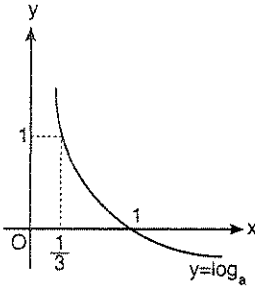
Çözüm / Solution:

$$\log_{20} 24 = \frac{\log 24}{\log 20} = \frac{\log 2^3 + \log 3}{\log 10 + \log 2}$$

$$= \frac{3 \cdot \log 2 + \log 3}{1 + \log 2} = \frac{3a + b}{1 + a}$$

Yanıt / Answer C

11.



$\Rightarrow \log_a 81 = ?$

- A) -4 B) -3 C) -2 D) 1 E) 3

(YÖS 2006)

Çözüm / Solution:

$$\log_a \frac{1}{3} = 1 \Rightarrow a = \frac{1}{3}$$

$$\log_{\frac{1}{3}} 81 = \log_{3^{-1}} 3^4 = -4 \log_3 3 = -4$$

Yanıt / Answer B

12. $\log_2 (x-3) + \log_2 (x+3) \leq 4$

$\Rightarrow ? < x < ?$

- A) $-5 < x < 0$ B) $-3 < x < 0$ C) $-3 < x < x$
D) $2 \leq x < 3$ E) $3 < x \leq 5$

(YÖS 2007)

Çözüm / Solution:

$$\log_2 (x-3) + \log_2 (x+3) \leq 4$$

$$\Rightarrow x-3 > 0, \quad x+3 > 0$$

$$x > 3, \quad x > -3$$

$$\Rightarrow x > 3 \dots\dots\dots (1)$$

$$\log_2 (x-3) + \log_2 (x+3) \leq 4$$

$$\log_2 (x-3) \cdot (x+3) \leq 4$$

$$x^2 - 9 < 2^4$$

$$x^2 - 9 < 16 \Rightarrow x^2 \leq 25$$

$$-5 \leq x \leq 5 \dots\dots\dots (2)$$

1 ve 2 denklemlerinden / from equation 1 and 2

$3 < x \leq 5$ bulunur. / obtained.

Yanıt / Answer E

$$1. \log_3 9 + \log_3 \frac{1}{27} + \log_3 \left(3^{\frac{4}{5}} \right) = ?$$

Yanıt / Answer : $-\frac{1}{5}$

$$2. \begin{cases} \log_3 x = 4 \\ \log_2 y = 8 \end{cases} \Rightarrow \log_6 (x \cdot y) = ?$$

Yanıt / Answer : $4 + \frac{4}{1 + \log_2 3}$

$$3. \log_2 (x + 1) = 2 \Rightarrow x = ?$$

Yanıt / Answer : 3

$$4. \begin{cases} \log_b x = 2 \\ \log_{\frac{1}{b}} y = -4 \end{cases} \Rightarrow \log_b (x \cdot y) = ?$$

Yanıt / Answer : 6

$$5. \log_a \sqrt[3]{0,04} = -\frac{2}{3} \Rightarrow \log_a 625 = ?$$

Yanıt / Answer : 2

$$6. \log_2 x + \log_2 (x + 8) = 7 \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : {8}

$$7. \log_3 \left(\frac{1}{3^a} \right) = 2^{\log_2 3} \Rightarrow a = ?$$

Yanıt / Answer : 1

$$8. \log_5 (3x - 15) \leq 0 \Rightarrow \text{ÇK(SS)} = ?$$

Yanıt / Answer : $5 < x \leq \frac{16}{3}$

9. $f(x) = \log_3(4x - 1) + 2 \Rightarrow f^{-1}(5) = ?$

Yanıt / Answer : 7

10. $3^{\log_2 x} = 5^{\log_2 3} \Rightarrow x = ?$

Yanıt / Answer : 5

11. $\log_2(\log_3 16 \cdot \log_2 81) = ?$

Yanıt / Answer : 4

12. $a^{\log_3 5} + 5^{\log_3 a} = 10 \Rightarrow a = ?$

Yanıt / Answer : 3

13. $\log_{\frac{1}{3}}(x-2) > 3 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : $2 < x < \frac{55}{27}$

14. $3^{2x} - 5 \cdot 3^x + 6 = 0 \Rightarrow \text{ÇK(SS)} = ?$

Yanıt / Answer : $\{1, \log_3 2\}$

15. $\log_2^2(x-2) - 3\log_2(x-2) - 10 = 0 \Rightarrow x = ?$

Yanıt / Answer : $\frac{153}{2}$

16. $\sqrt[3]{\log_2(x+2)} + 2 = 2 \Rightarrow x = ?$

A) 54 B) 62 C) 96 D) 124 E) 128

Yanıt / Answer : 62

17. $\frac{(\log_2 20)^2 - (\log_2 5)^2}{\log_2 10} = ?$

Yanıt / Answer : 4

18. $\log_2 (\log_{10} x) = 3 \Rightarrow x = ?$

Yanıt / Answer : 10^8

19. $3^n = a, \log_a 81^2 = n^2 \Rightarrow n = ?$

Yanıt / Answer : 2

20. $\log_a 2 + \log_a 4 + \log_a 8 = 24 \Rightarrow a = ?$

Yanıt / Answer : $\sqrt[4]{2}$

21. $(\log_{a-1} 9) \log_2 16 = 16 \Rightarrow a = ?$

Yanıt / Answer : 4

22. $\log_{10} (\log_8 x) + \log_{10} (\log_x 8) = ?$

Yanıt / Answer : 0

23. $\left. \begin{array}{l} \log_2 3 = a \\ \log_2 5 = b \end{array} \right\} \Rightarrow \log 60 = ?$

Yanıt / Answer : $\frac{2+a+b}{1+b}$

24. $\log_5(-x) + \log_5(4-x) = \log_5 12 \Rightarrow x = ?$

Yanıt / Answer : -2

25. $\log_3 (26!) = x \Rightarrow \log_3 (27!) = ?$

Yanıt / Answer : $3 + x$

26. $\log_3 5 = a \Rightarrow \log_{81} 15 = ?$

Yanıt / Answer : $\frac{a+1}{4}$

27. $x > 0, \log_2 [\log_3 (x^2+17)] = 2 \Rightarrow x = ?$

Yanıt / Answer : 8

28. $\left. \begin{array}{l} \ln(xy) = 3 \\ \ln x - \ln y = 1 \end{array} \right\} \Rightarrow x = ?$

Yanıt / Answer : e^2

29. $\log_5 (x-2) + \log_5 (x+2) = 1 \Rightarrow \text{ÇK (SS)} = ?$

Yanıt / Answer : {3}

30. $f(x) = 3 + 2 \cdot \log_{16} (3x-2) \Rightarrow f^{-1}(3) = ?$

Yanıt / Answer : 1

31. $\log_{81} x + \log_{27} x = \log_3 x \Rightarrow \text{ÇK (SS)} = ?$

Yanıt / Answer : {1}

32. $\log x + \log (2x+1) = 0 \Rightarrow x = ?$

Yanıt / Answer : $\frac{1}{2}$

1. $\begin{cases} \log_2 x = 3 \\ \log_3 y = 2 \end{cases} \Rightarrow x + y = ?$
A) 12 B) 14 C) 15 D) 17 E) 19

2. $x = \log_{\sqrt[4]{2}} 16 \Rightarrow x = ?$
A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 2 D) 4 E) 16

3. $\log_2 (x - 4) = \log_5 (\log_3 3) \Rightarrow x = ?$
A) 4 B) 5 C) 6 D) 7 E) 8

4. $\log_{\frac{1}{2}} 16 = x$ ve (and) $\log_3 \left(\frac{1}{27}\right) = y \Rightarrow x \cdot y = ?$
A) 3 B) 6 C) 8 D) 9 E) 12

5. $\ln e^6 + \log_{0,1} 0,001 = ?$
A) 5 B) 6 C) 7 D) 8 E) 9

6. $\log_{\frac{1}{8}} [\log_9 (\log_3 x)] = \frac{1}{3} \Rightarrow x = ?$
A) 2 B) 3 C) 9 D) 27 E) 81

7. $\log_5 \left(\frac{1}{5}\right) + \log 0,001 = ?$
A) -5 B) -4 C) -3 D) -2 E) -1

8. $\log_{\sqrt{3}} 9 + \log_5 (\log_3 243) = ?$
A) 2 B) 3 C) 4 D) 5 E) 6

9. $\log_7 9 \cdot \log_3 5 \cdot \log_{25} 7 = ?$

- A) 1 B) $\frac{5}{3}$ C) 2 D) $\frac{7}{3}$ E) 3

10. $\log_7 10 = a \Rightarrow \log_{100} 7 = ?$

- A) $\frac{1}{a}$ B) $\frac{2}{a}$ C) $\frac{1}{2a}$ D) a^2 E) $2a$

11. $\log 2 = a$ ve (and) $\log 3 = b \Rightarrow \log 108 = ?$

- A) $a + b$ B) $a + 2b$ C) $2a + b$
D) $2a + 3b$ E) $3a + 4b$

12. $\log_5 7 = x$ ve (and) $\log_5 2 = y \Rightarrow \log_{49} 40 = ?$

- A) $\frac{1+3y}{2x}$ B) $\frac{1+2y}{3x}$ C) $\frac{1+2x}{3y}$
D) $\frac{1+3x}{2y}$ E) $\frac{x+3y}{2}$

13. $\log_2 3 = a$ ve (and) $\log_8 3 = b \Rightarrow a = ?$

- A) $\frac{b}{3}$ B) $\frac{b}{2}$ C) b D) $2b$ E) $3b$

14. $\log_3 2x \cdot \log_2 3 = 3 \Rightarrow x = ?$

- A) 2 B) 3 C) 4 D) 5 E) 6

15. $4^a = 27 \Rightarrow \log_6 12 = ?$

- A) $\frac{2a+5}{a+3}$ B) $\frac{2a+3}{2a+5}$ C) $\frac{2a+4}{a+6}$
D) $\frac{2a+3}{3a+2}$ E) $\frac{2a+6}{2a+3}$

16. $2^{\log_2 5} + 5^{2\log_5 2} = ?$

- A) 8 B) 9 C) 10 D) 11 E) 12

17. $5^{\log_a 3} + 3^{\log_a 5} = 50 \Rightarrow a = ?$

- A) 1 B) $\sqrt{2}$ C) $\sqrt{3}$ D) 2 E) $\sqrt{5}$

18. $\left. \begin{array}{l} \log_3 5 = a \\ \log_3 2 = b \end{array} \right\} \Rightarrow \log_6 30 = ?$

- A) $\frac{a+b}{1+b}$ B) $\frac{a+b+1}{1+a}$ C) $\frac{a+b+1}{1+b}$
D) $\frac{a-b+1}{1+a}$ E) $\frac{a-b+1}{1+b}$

Yanıtlar / Answers

1. D	2. E	3. B	4. E	5. E	6. D
7. B	8. D	9. A	10. C	11. D	12. A
13. E	14. C	15. E	16. B	17. C	18. C

1. $\log_3 4 = x \Rightarrow \log_3 162 = ?$
 A) $\frac{x-8}{2}$ B) $\frac{x+8}{2}$ C) $x+4$
 D) $x-4$ E) $\frac{x-4}{2}$
2. $\frac{1}{\log_2 18} + \frac{1}{\log_6 18} + \frac{1}{\log_{27} 18} = ?$
 A) 2 B) 3 C) 4 D) 5 E) 6
3. $a = \log_4 5, b = \log_{\frac{1}{5}} 4, c = \log_5 4 \Rightarrow ? < ? < ?$
 A) $a < b < c$ B) $c < b < a$
 C) $a < c < b$ D) $b < c < a$
 E) $b < a < c$
4. $\log_5 a - \log_5 b = 2 \Rightarrow \frac{10b-a}{5b} = ?$
 A) -3 B) -4 C) -5 D) -6 E) -7
5. $\log_3 63 = x, \log_7 81 = y \Rightarrow y = ?$
 A) $\frac{4}{x}$ B) $\frac{4}{x+1}$ C) $\frac{4}{x-1}$
 D) $\frac{4}{x-2}$ E) $\frac{4}{x+2}$
6. $125^{\log_5 2} + \log_5 0,008 = ?$
 A) 7 B) 6 C) 5 D) 4 E) 3
7. $\log x = b - \log a \Rightarrow x = ?$
 A) $a \cdot b \cdot 10$ B) $10 \cdot a \cdot b$ C) $109 \cdot b$
 D) $\frac{10^b}{a}$ E) $\frac{a \cdot b}{10}$
8. $\left. \begin{array}{l} \log 2 = a \\ \log 3 = b \end{array} \right\} \Rightarrow \log 72 = ?$
 A) $3a$ B) $a + b$ C) $3b$
 D) $3a + 2b$ E) $2a + 2b$
9. $\ln 4 \cdot \log_4 9 \cdot \log_3 e = ?$
 A) 1 B) 2 C) 4 D) $\ln 5$ E) $\frac{2}{\ln 10}$
10. $\log 40 = x \Rightarrow \log 25 = ?$
 A) $3 - 2x$ B) $2 - x$ C) $3 - 4x$
 D) $1 - x$ E) $3 - x$

11. $\log(2x+4) - \log(x-2) = 1 \Rightarrow x = ?$

- A) 7 B) 6 C) 5 D) 4 E) 3

12. $2\sqrt{\ln x} - \ln\sqrt{x} = 0 \Rightarrow x = ?$

- A) $\{1, e^4\}$ B) $\{e^4, e^{16}\}$ C) $\{1, e^{16}\}$
D) $\{2, e^4\}$ E) $\{2, e^{16}\}$

13. $\log_x 3 > \log_x (4-x) \Rightarrow x \in ?$

- A) $(3, +\infty)$ B) $(0, 4) - \{1\}$ C) $(0, 3) - \{1\}$
D) $(3, 4)$ E) $(4, +\infty)$

14. $\log 2 = a, \log 3 = b$ ve $\log 7 = c \Rightarrow \log 420 = ?$

- A) $a+b+c$ B) $a+b+c+1$
D) $a-b+c-1$ E) $a \cdot b \cdot c + 12$
E) $a \cdot b \cdot c - 1$

15. $\log_{15} 3 = a \Rightarrow \log_5 15 = ?$

- A) $a-1$ B) $a+1$ C) $3a$
D) $\frac{1}{a+1}$ E) $\frac{1}{1-a}$

16. $\log_3 x + 5 \log_x 3 = 6 \Rightarrow x = ?$

- A) $\{3, 243\}$ B) $\{3, 8\}$ C) $\left\{\frac{1}{3}, \frac{1}{81}\right\}$
D) $\left\{\frac{1}{243}, \frac{1}{3}\right\}$ E) $\{27, 81\}$

17. $\log_3 a - \log_{\frac{1}{3}} b = 3, \log_4 (a+b) = 2$

$\Rightarrow a^2 + b^2 = ?$

- A) 54 B) 148 C) 202 D) 256 E) 310

18. $\log_4 [\log_5 (\ln x)] = 0 \Rightarrow x = ?$

- A) 0 B) 1 C) e^3 D) e^4 E) e^5

19. $\log_5 (x+y) + \log_5 (x-y) = 2$

$x+y=25 \Rightarrow x^2+y^2 = ?$

- A) 83 B) 125 C) 193
D) 313 E) 625

20. $\log_{16} a + \log_4 a - \log_2 a = 0,5 \Rightarrow a = ?$

- A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) 2 E) 3

Yanıtlar / Answers					
1. B	2. A	3. D	4. A	5. D	6. C
7. D	8. D	9. B	10. E	11. E	12. C
13. B	14. B	15. E	16. A	17. C	18. E
19. D	20. A				

1. $\log_2 3 = x \Rightarrow \log_9 2 = ?$

- A) $\frac{1}{2x}$ B) $\frac{x}{2}$ C) $\frac{x+1}{2}$ D) $\frac{1}{x+2}$ E) $\frac{2}{x+1}$

2. $\log_a 9 = 6 \Rightarrow \log_{27} a = ?$

- A) $\frac{1}{9}$ B) $\frac{1}{6}$ C) $\frac{1}{4}$ D) 2 E) 5

3. $\log_4 [\log_3 (\ln x)] = 0 \Rightarrow x = ?$

- A) 12 B) e C) 64 D) e^2 E) e^3

4. $\log_a b = 6 \Rightarrow$

$\log_a bc + \log_a \frac{b}{c} = ?$

- A) 15 B) 14 C) 13 D) 12 E) 11

5. $a^{\log_a 6} + b^{\log_b \frac{x}{5}} = 9 \Rightarrow x = ?$

- A) 15 B) 12 C) 10 D) 9 E) 6

6. $\frac{1}{\log_9 3} + \log_3 x = 5 \Rightarrow x = ?$

- A) 1 B) 3 C) 6 D) 9 E) 27

7. $\frac{1}{\log_4 2} + \frac{1}{\log_8 2} + \frac{1}{\log_{16} 2} = ?$

- A) 2 B) 3 C) 4 D) 7 E) 9

8. $\log_4 8 \cdot \log_8 32 = ?$

- A) $\frac{5}{2}$ B) $\frac{5}{3}$ C) $\frac{3}{2}$ D) 1 E) $\frac{1}{2}$

9. $\log_x 3 + \log_9 x = \frac{3}{2} \Rightarrow \log (x^2 + 1) = ?$

- A) $\log 5$ B) 1 C) 2
D) 3 E) $\log 17$

10. $100^{\log x} = x^2 - 2x + 4 \Rightarrow x = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

11. $\log_3 16 \cdot \log_2 \frac{1}{27} = x \Rightarrow x = ?$

- A) -12 B) -6 C) $\frac{2}{3}$ D) 6 E) 12

12. $\log_2 \left(\frac{1}{16}\right) = x \Rightarrow x = ?$

- A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) -2 E) -4

13. $\log \sqrt{125} \cdot \ln 10 \cdot \log_5 e = ?$

- A) 1 B) $\frac{e}{10}$ C) e D) $\frac{3}{2}$ E) $\frac{5}{3}$

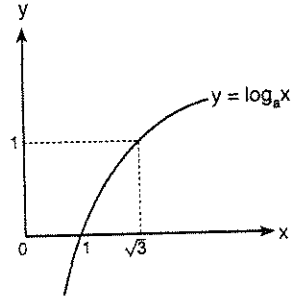
14. $\log_b \frac{1}{a} = 2$
 $\log_c b = 3 \Rightarrow \log_{\frac{1}{c}} a = ?$

- A) $-\frac{1}{6}$ B) $\frac{1}{6}$ C) $\frac{1}{2}$ D) $\frac{3}{2}$ E) 6

15. $3 + \log_5 10 - \log_5 50 = ?$

- A) -1 B) 0 C) 1 D) 2 E) 3

16.



$x = 27 \Rightarrow y = ?$

- A) 3 B) 6 C) 9 D) 12 E) 36

17. $3^{2+\ln x} + 3^{\ln x} = 270 \Rightarrow x = ?$

- A) e B) e^2 C) e^3 D) e^4 E) e^5

18. $1 + \ln(e - x) = \ln(x + 3) \Rightarrow x = ?$

- A) $\frac{e+3}{e-1}$ B) $\frac{e^2-1}{e+3}$ C) $\frac{e^2-3}{e+1}$
D) $\frac{e-1}{e^2+3}$ E) $\frac{e-1}{e-3}$

19. $f(x) = \log_3(2x-m)$, $f^{-1}(2) = 3 \Rightarrow m = ?$

- A) -9 B) -6 C) -3 D) 2 E) 4

20. $\log_{\frac{1}{2}}(x-2) \geq 0 \Rightarrow \text{ÇK(ŞŞ)} = ?$

- A) [2,3] B) (2,4) C) (3,∞)
D) [2,3] E) (2,3]

Yanıtlar / Answers

1. A	2. A	3. E	4. D	5. A	6. E
7. E	8. A	9. B	10. B	11. A	12. E
13. D	14. E	15. D	16. B	17. C	18. C
19. C	20. E				

1. $\frac{1+\log 90}{\log 30} = ?$

- A) 1 B) 2 C) 3 D) 4 E) 5

2. $k \in \mathbb{Z}^+$ ve (and) $0 < m < 1$
 $\log(218672163,35) = k + m \Rightarrow k = ?$

- A) 6 B) 7 C) 8 D) 9 E) 10

3. $5^n = a \Rightarrow \log_{25} a = ?$

- A) $\frac{n}{10}$ B) $5n$ C) $2n$ D) $\frac{n}{5}$ E) $\frac{n}{2}$

4. $\log \frac{x}{5} + 1 = \log x - \log(2-x) \Rightarrow \sum x = ?$

- A) $\frac{7}{5}$ B) $\frac{5}{3}$ C) $\frac{5}{4}$ D) $\frac{3}{2}$ E) $\frac{4}{5}$

5. $\log x = a, \log y = b \Rightarrow \operatorname{colog} \frac{x}{y} = ?$

- A) $\frac{a}{b}$ B) $a+b$ C) $b \cdot a$
 D) $a-b$ E) $b-a$

6. $\log_{27} x + \log_9 x = \frac{5}{2} \Rightarrow \log_{81} x = ?$

- A) $\frac{2}{3}$ B) $\frac{3}{5}$ C) $\frac{3}{4}$ D) $\frac{4}{3}$ E) $\frac{5}{3}$

7. $\log_4 7 = a \Rightarrow \log_7 28 = ?$

- A) $\frac{2}{a}$ B) $\frac{a+1}{a}$ C) $\frac{a-1}{4}$
 D) $\frac{a+1}{4}$ E) $\frac{2a+1}{2}$

8. $\log 2 = a$
 $\log 3 = b$
 $\Rightarrow \log_5 18 = ?$

- A) $\frac{a+b}{a-b}$ B) $\frac{a(a+b)}{a-b}$ C) $\frac{a+2b}{1-a}$
 D) $\frac{a(b+2a)}{b(1-a)}$ E) $\frac{b(a+2b)}{a(1-b)}$

9. $\log_3 \sqrt[3]{a \sqrt[3]{a \sqrt[3]{a \dots}}} = 2 \Rightarrow a = ?$

- A) 9 B) 27 C) 81 D) 243 E) 729

10. $\log_x y \cdot \log_y x^2 \cdot \log_3 \left(\frac{x-1}{3}\right) = 2 \Rightarrow x = ?$

- A) 6 B) 7 C) 8 D) 9 E) 10

11. $x^2 - x \log a + \log b = 0 \Rightarrow \text{ÇK (SS)} = \{x_1, x_2\}$

$\frac{1}{x_1} + \frac{1}{x_2} = \frac{1}{3}$ olduğuna göre, a ile b arasındaki bağıntı aşağıdakilerden hangisidir?

What is the relation between a and b ?

- A) $b = a^3$ B) $3a = b$ C) $a = b^2$
D) $\frac{a}{b} = 3$ E) $a \cdot b = 2$

12. $\log_3 x + \log_x 3 = 2 \Rightarrow \text{ÇK(SS)} = ?$

- A) $\{3, 4\}$ B) $\{3, \frac{1}{3}\}$ C) $\{3\}$
D) $\{2\}$ E) $\{2, 3\}$

13. $\log(5x + 10)^2 - \log(3x - 4)^2 = 2 \Rightarrow x_1 = a$
 $\Rightarrow \log 4a = ?$

- A) 8 B) 4 C) 2 D) $\frac{1}{4}$ E) $\frac{1}{2}$

14. $a, b > 1$

$\log_b (\log_a \sqrt[b]{a}) = \log_a x \Rightarrow x^{-1} = ?$

- A) a B) $\frac{1}{a}$ C) b D) $\frac{1}{b}$ E) $a \cdot b$

15. $\frac{2}{3} \log(x^2 - y^2) - \frac{1}{2} [\log(x - y) + \log(x + y)] = ?$

- A) $\log \sqrt{x-y}$ B) $\log \sqrt[3]{x^2+y^2}$
C) $\log \sqrt[6]{x^2+y^2}$ D) $\log \sqrt[6]{x^2-y^2}$
E) $\log \sqrt[3]{x^2-y^2}$

16. $\log_{(b+c)} a + \log_{(c-b)} a = 2 \cdot \log_{(c+b)} a \cdot \log_{(c-b)} a$ olduğuna göre a, b, c arasındaki bağıntı aşağıdakilerden hangisidir?

What is the relation between a, b and c ?

- A) $b^2 = a^2 + c^2$ B) $c^2 = b^2 + a^2$ C) $a^2 = b^2 + c^2$
D) $a^2 = 2b + 2c$ E) $a = b + c$

17. $\log_{\frac{1}{3}} (\sin x) = 2 \Rightarrow \cos x = ?$

- A) $\frac{4\sqrt{5}}{9}$ B) $\frac{2\sqrt{5}}{3}$ C) $\frac{\sqrt{5}}{9}$
D) $\frac{\sqrt{5}}{3}$ E) $\frac{2\sqrt{5}}{5}$

18. $x \in \mathbb{Z}$

$\log_4(2x - 5) < \log_2 3 \Rightarrow \sum x = ?$

- A) 10 B) 14 C) 15 D) 18 E) 22

19. $x^{\log x} = \frac{x^3}{100} \Rightarrow x_1 \cdot x_2 = ?$

- A) 10 B) 100 C) 400 D) 900 E) 1000

20. $(\log_4 x)^2 - 7 \log_4 x + 12 = 0 \Rightarrow \sum x = ?$

- A) 64 B) 128 C) 250 D) 256 E) 320

Yanıtlar / Answers

1. B	2. C	3. E	4. D	5. E	6. C
7. B	8. C	9. C	10. E	11. A	12. C
13. E	14. A	15. D	16. B	17. A	18. D
19. E	20. E				

1. $\log \frac{x^3 \cdot y^2}{z^4} = ?$
 A) $\frac{7 \log x \cdot \log y}{4 \cdot \log z}$ B) $\frac{3xy}{2z}$ C) $\frac{\log x^3 - y^2}{\log z^4}$
 D) $3 \log + y^2 - z^4$ E) $3 \log x + 2 \log y - 4 \log z$
2. $\log_2 5 = x$ ve $\log_5 2 = y$ ise x ile y arasındaki bağıntı aşağıdakilerden hangisinde vardır?
What is the relation between x and y ?
 A) $x - y = 1$ B) $x \cdot y = 12$ C) $x \cdot y = 1$
 D) $\frac{x}{y} = \frac{4}{3}$ E) $x + y = 7$
3. $\frac{1}{4} \log a - \frac{3}{4} \log b + \log c = ?$
 A) $\log \frac{\sqrt[4]{a} \cdot c}{\sqrt[4]{b^3}}$ B) $\log \frac{\sqrt[4]{b^2}}{\sqrt[4]{a \cdot c}}$
 C) $\log \sqrt[4]{a \cdot c} - b$ D) $\log \frac{a^4 b^3}{c}$
 E) $\log \frac{a^4 b^3}{\sqrt[4]{ab^3}}$
4. $\log_5 3 = x \Rightarrow \log_{15} 5 = ?$
 A) $\frac{1}{x}$ B) $\frac{1}{x^2}$ C) $\frac{x+1}{3}$
 D) $\frac{1}{x+1}$ E) 1
5. $f(x) = \log_3 (3x + 2) \Rightarrow f^{-1}(x) = ?$
 A) $\frac{3^x + 1}{2}$ B) $\frac{5^x - 5}{3}$ C) $\frac{5^x - 3}{2}$
 D) $\frac{3^x - 3}{3}$ E) $\frac{3^x - 2}{3}$
6. $f(x) = 2^{2x-1} \Rightarrow f^{-1}(x) = ?$
 A) $\frac{\log_2 x - 1}{2}$ B) $\log_2 x - 1$
 C) $\log_2 x - 2$ D) $\frac{\log_2 x + 1}{2}$
 E) $\frac{\log_2 x - 2}{3}$
7. $\log_2 5 = a \Rightarrow \log_5 50 = ?$
 A) a B) $\frac{a+1}{2}$ C) $\frac{a-1}{2}$
 D) $\frac{a+2}{a}$ E) $\frac{1+2a}{a}$
8. $2^{x+1} - 2^x = 32 \Rightarrow \text{ÇK (SS)} = ?$
 A) {3} B) {5} C) {6} D) {7} E) {16}
9. $\log_4 7 = x \Rightarrow \log_4 28 = ?$
 A) $\frac{x+1}{x}$ B) $\frac{1-x}{x}$ C) $1+x$
 D) $\frac{1}{1+x}$ E) $1-x$
10. $\log_3 (a - 2) = 1 \Rightarrow a = ?$
 A) 1 B) 2 C) 3 D) 4 E) 5

11. $\log_5 3 = x \Rightarrow \log_{25} 18 = ?$

- A) $x + 3$ B) $\log_5 2 + x$ C) $\log_5 \sqrt{2} + x$
D) $\log_5 \sqrt{2} - x$ E) $\frac{3x+1}{3}$

12. $\log_a 3 + \log_a 4 = \frac{1}{2} \Rightarrow a = ?$

- A) 81 B) 100 C) 121 D) 144 E) 169

13. $\log_{56} 8 = x$

$\log_{56} 7 = y \Rightarrow \log_{56} 14 = ?$

- A) $x^2 + y^3$ B) $x + y$ C) $\frac{x+3y}{3}$
D) $\frac{1}{2(x-y)}$ E) $2x - y$

14. $\log(a+3) + \log a = 1 \Rightarrow \text{ÇK (SS)} = ?$

- A) {2} B) {3} C) {4} D) $\left\{\frac{1}{2}\right\}$ E) $\left\{\frac{1}{3}\right\}$

15. $\log_2 5 \cdot \log_5 3 \cdot \log_3 1 = \log_4 (a^2 - 8) \Rightarrow a = ?$

- A) ∓ 2 B) ∓ 3 C) ∓ 4 D) 7 E) 8

16. $2^{\log_2 x^2} + x^{\log_2 x} = 16 \Rightarrow x = ?$

- A) $\sqrt{2}$ B) $\sqrt{3}$ C) $-\sqrt{2}$ D) $-\sqrt{5}$ E) 3

17. $5^{\log_5(a-2)} + 6^{2 \log_6 a} = 10 \Rightarrow \text{ÇK (SS)} = ?$

- A) {3} B) {2} C) {1} D) {-2} E) $\emptyset$

18. $\log_3(x-2) + \log_3 6 = 2 \Rightarrow x = ?$

- A) $\frac{7}{2}$ B) $\frac{2}{7}$ C) $\frac{3}{4}$ D) 3 E) 7

19. $\ln x = p \Rightarrow \log x^2 = ?$

- A) $p \cdot \log 2e$ B) $2p \cdot \log e$ C) $\frac{p}{\ln 10}$
D) $p \cdot \ln 2$ E) $2p \cdot \log 2$

20. $\ln(a \cdot b) = 4x, \ln\left(\frac{a}{b}\right) = 4y \Rightarrow x = ?$

- A) e^{x+y} B) e^x C) e^y
D) $e^{4(x+y)}$ E) $e^{2(x+y)}$

Yanıtlar / Answers

1. E	2. C	3. A	4. D	5. E	6. D
7. E	8. B	9. C	10. E	11. C	12. D
13. C	14. A	15. B	16. A	17. A	18. A
19. B	20. E				

Tanım: $R_{[x]}$ polinomlar halkasında x elemanı yerine ($i^2 = -1$) i değeri yazılarak elde edilen $R_{[i]} = C$ kümesine karmaşık sayılar kümesi, $a, b \in R$ olmak üzere, bu kümenin $z = a + bi$ biçiminde yazılabilen elemanlarına da **karmaşık sayı** adı verilir.

Karmaşık sayılar kümesi;

$$C = \{a + bi \mid a \in R, b \in R, i^2 = -1\}$$

dir.

Bir karmaşık sayı esas olarak (a, b) şeklinde, bir reel sayı ikilisi ile gösterilirse, yani; $a + bi = (a, b)$ olarak düşünülürse bunların eşitliği, toplamı ve çarpımı aşağıdaki gibi olur.

1. $(a, b) = (c, d) \Rightarrow a = c \wedge b = d$
2. $(a, b) + (c, d) = (a + c, b + d)$
3. $(a, b) \cdot (c, d) = (ac - bd, ad + bc)$

Bir a reel sayısını $a + 0i = (a, 0)$ karmaşık sayısı ile gösterilebilir. O halde, $0 + i$ karmaşık sayısı da $0 + i = (0, 1)$ şeklinde gösterilir.

$$\begin{aligned} (0, 1) \cdot (0, 1) &= (0 - 1, 0 + 0) \\ &= (-1, 0) \\ &= -1 \\ (a, b) &= (a, 0) + (0, b) \\ (0, b) &= (b, 0)(0, 1) \\ &= (b \cdot 0 - 0, b + 0) \\ &= (0, b) \\ (a, b) &= (a, 0) + (b, 0) \cdot (0, 1) \\ &= a + bi \end{aligned}$$

$N \subset Z \subset Q \subset R \subset C$ dir. $z = a + bi$ karmaşık sayısında

$a \in R$, z karmaşık sayısının reel kısmı olup

$\text{Re}(z) = a$ dir.

$b \in R$ ise z karmaşık sayısının sanal(imajiner) kısmı olup,

$\text{Im}(z) = b$ ile gösterilir.

Definition: For the $R_{[x]}$ polynomial ring if x is replaced with $i(i^2 = -1)$, we have the set $R_{[i]} = C$ is the set of complex numbers. The members of this set are denoted by z .

$z = a + bi$ where $a, b \in R$ and $i^2 = -1$ is called a **complex number**.

$$C = \{a + bi \mid a \in R, b \in R, i^2 = -1\}$$

If a pair of real number (a, b) is assigned to a complex number which means determining $a + bi$ as (a, b) then the equality, the addition and the multiplication is as the following:

1. $(a, b) = (c, d) \Rightarrow a = c \wedge b = d$
2. $(a, b) + (c, d) = (a + c, b + d)$
3. $(a, b) \cdot (c, d) = (ac - bd, ad + bc)$

For any real number a , a may be denoted by $a + 0 \cdot i = (a, 0)$.

Similarly a complex number i is denoted by $0 + i = (0, 1)$

$$\begin{aligned} (0, 1) \cdot (0, 1) &= (0 - 1, 0 + 0) \\ &= (-1, 0) \\ &= -1 \\ (a, b) &= (a, 0) + (0, b) \\ (0, b) &= (b, 0)(0, 1) \\ &= (b \cdot 0 - 0, b + 0) \\ &= (0, b) \\ (a, b) &= (a, 0) + (b, 0) \cdot (0, 1) \\ &= a + bi \end{aligned}$$

For number sets $N \subset Z \subset Q \subset R \subset C$.

In $z = a + bi$, a is called as **real part** and b is called the **imaginary part** and they are shown as $\text{Re}(z) = a$ and $\text{Im}(z) = b$ respectively.

Örnek / Example 1:

$$z_1 = (2a - 3) + (b - 2)i$$

$$z_2 = (a - 9) + (4 - b)i,$$

$$z_1 = z_2 \Rightarrow a \cdot b = ?$$

Çözüm / Solution:

$$z_1 = z_2 \Rightarrow 2a - 3 = a - 9 \wedge b - 2 = 4 - b$$

$$\Rightarrow a = -6 \wedge 2b = 6$$

$$\Rightarrow a = -6 \wedge b = 3$$

$$\Rightarrow a \cdot b = (-6) \cdot (3) = -18$$

Örnek / Example 2:

$$z_1 = 4 - 3i, z_2 = 3 + i \Rightarrow z_1 \cdot z_2 = ?$$

Çözüm / Solution 1:

$$z_1 = (4, -3), z_2 = (3, 1)$$

$$z_1 \cdot z_2 = (4, -3) \cdot (3, 1)$$

$$= (4 \cdot 3 - (-3) \cdot 1, 4 \cdot 1 + (-3) \cdot 3)$$

$$= (12 + 3, 4 - 9)$$

$$= (15, -5)$$

$$= 15 - 5i$$

Çözüm / Solution 2:

$$z_1 \cdot z_2 = (4 - 3i) \cdot (3 + i)$$

$$= 12 + 4i - 9i - 3i^2$$

$$= 12 - 5i + 3$$

$$= 15 - 5i$$

**KARMAŞIK SAYILARIN EŞLENİĞİ****COMPLEX CONJUGATES**

$z = a + bi$ karmaşık sayısının eşleniği $\bar{z} = a - bi$ dir.

For any $z = a + bi$, the conjugate is denoted by $\bar{z}$ and

$z = a - bi$.

**EŞLENİK ÖZELLİKLERİ****PROPERTIES of the CONJUGATES**

$$1. \bar{\bar{z}} = z$$

$$2. \overline{z_1 \pm z_2} = \bar{z}_1 \pm \bar{z}_2$$

$$3. \overline{z_1 \cdot z_2} = \bar{z}_1 \cdot \bar{z}_2$$

$$4. \overline{\left(\frac{z_1}{z_2}\right)} = \frac{\bar{z}_1}{\bar{z}_2}, (z_2 \neq 0)$$

$$5. z = a + bi \Rightarrow z \cdot \bar{z} = a^2 + b^2$$

**i' NİN TAMSAYI OLAN KUVVETLERİ****INTEGER POWERS of i**

$$i^0 = 1,$$

$$i^1 = i,$$

$$i^2 = -1$$

$$i^m \cdot i^n = i^{m+n}$$

$$i^3 = -i,$$

$$i^4 = 1,$$

$$i^5 = i,$$

$$i^6 = -1$$

$$i^n = \begin{cases} 1, & n \equiv 0 \pmod{4} \\ i, & n \equiv 1 \pmod{4} \\ -1, & n \equiv 2 \pmod{4} \\ -i, & n \equiv 3 \pmod{4} \end{cases}$$

Örnek / Example 3:

$$i^{49} = ?$$

Çözüm / Solution:

$$49 \equiv 1 \pmod{4}$$

$$i^{49} = i$$

$$I. (1 + i)^2 = 2i$$

$$II. (1 - i)^2 = -2i$$

Örnek / Example 4:

$$z = (1 + i)^{27} = ?$$

Çözüm / Solution:

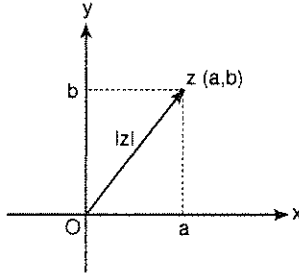
$$z = (1 + i)^{27} = ((1 + i)^2)^{13} \cdot (1 + i)$$

$$z = (2i)^{13} \cdot (1 + i) = 2^{13} \cdot i^{13} \cdot (1 + i)$$

$$z = 2^{13} \cdot i(1 + i) = 2^{13} \cdot (i - 1) = 2^{13} (-1 + i)$$



BİR KARMAŞIK SAYININ MODÜLÜ MODULUS of a COMPLEX NUMBER



Bir karmaşık sayının orijine olan uzaklığına o karmaşık sayının **mutlak değeri (modülü)** denir. $|z|$ biçiminde gösterilir.
The distance from a complex number z to the origin is called the **absolute value or modulus** of z . It is shown by $|z|$.

$$|z| = \sqrt{a^2 + b^2}$$



MODÜL ÖZELLİKLERİ / MODULUS PROPERTIES

1. $z \cdot \bar{z} = |z|^2$
2. $|z| = |\bar{z}| = |-z| = |-\bar{z}|$
3. $\left| \frac{z_1}{z_2} \right| = \frac{|z_1|}{|z_2|} \quad (z_2 \neq 0)$
4. $|z_1 \cdot z_2| = |z_1| \cdot |z_2|$
5. $|z^n| = |z|^n$
6. $\left| \frac{1}{z} \right| = \frac{1}{|z|}$

Örnek / Example 5:

$$z = \frac{(3 + \sqrt{3}i)^2 \cdot (2 - 2\sqrt{3}i)}{3 - 3\sqrt{3}i} \Rightarrow |z| = ?$$

Çözüm / Solution:

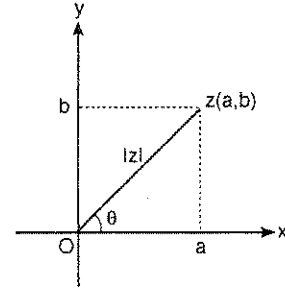
$$|z| = \left| \frac{(3 + \sqrt{3}i)^2 \cdot (2 - 2\sqrt{3}i)}{3 - 3\sqrt{3}i} \right|$$

$$|z| = \frac{|3 + \sqrt{3}i|^2 \cdot |2 - 2\sqrt{3}i|}{|3 - 3\sqrt{3}i|}$$

$$|z| = \frac{(\sqrt{9+3})^2 (\sqrt{4+12})}{\sqrt{9+27}} = \frac{12 \cdot 4}{6} = 2 \cdot 4 = 8$$



KARMAŞIK SAYILARIN KUTUPSAL FORMDA YAZILIŞI POLAR (Trigonometric) FORM of a COMPLEX NUMBER



$$z = a + bi,$$

$$\cos \theta = \frac{a}{|z|}$$

$$\Rightarrow a = |z| \cdot \cos \theta$$

$$\sin \theta = \frac{b}{|z|}$$

$$\Rightarrow b = |z| \cdot \sin \theta$$

Bu değerler $z = a + bi$ ifadesinde yerine yazılırsa aşağıdaki denklemler bulunur.

$$z = |z| \cdot \cos \theta + i |z| \cdot \sin \theta$$

$$z = |z| (\cos \theta + i \sin \theta)$$

Karmaşık sayıların bu şekilde yazılışına **kutupsal (Trigonometrik) biçimde yazılış** denir.

θ gerçel (reel) sayısına **z nin argümenti** denir. $\arg(z)$ ile gösterilir.

$0 \leq \theta \leq 2\pi$ ise θ ya **z nin esas argümenti** denir. $\arg(z)$ ile gösterilir. (r, θ) ya **z nin kutupsal bileşenleri** denir. $z(r, \theta)$ biçiminde gösterilir. Burada,

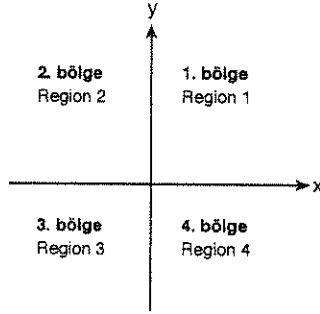
$$r = |z| \text{ dir.}$$

When we insert these values in equation $z = a + bi$, then we obtain in the following equation:

$$z = |z| \cdot \cos \theta + i |z| \cdot \sin \theta$$

$$z = |z| (\cos \theta + i \sin \theta)$$

This form is called the **polar or trigonometric form** of a complex number. The angle θ is called the **argument of z** , is shown by $\arg(z)$. When $0 \leq \theta \leq 2\pi$, θ is called as **principal argument**. (r, θ) is the **polar coordinates** of z . It is denoted by $z(r, \theta)$ Here $r = |z|$



$$\tan \alpha = \frac{|b|}{|a|}$$

$$z = a + bi = (a, b)$$

1. I. bölgede ise esas argüment $\theta = \alpha$ dir.
In the first quadrant, the principle argument is $\theta = \alpha$
2. II. bölgede ise esas argüment $\theta = \pi - \alpha$ dir.
In the second quadrant, the principle argument is $\theta = \pi - \alpha$
3. III. bölgede ise esas argüment $\theta = \pi + \alpha$ dir.
In the third quadrant, the principle argument is $\theta = \pi + \alpha$
4. IV. bölgede ise esas argüment $\theta = 2\pi - \alpha$ dir.
In the fourth quadrant, the principle argument is $\theta = 2\pi - \alpha$

Örnek / Example 6:

$z = -3 - 3\sqrt{3}i$ karmaşık sayısını kutupsal biçimde gösterimi nedir?

$z = -3 - 3\sqrt{3}i$, what is the polar form of z ?

Çözüm / Solution:

$z = -3 - 3\sqrt{3}i = (-3, -3\sqrt{3})$ (III. bölgede)
 $\theta = \pi + \alpha$ dir. (quadrant III)

$$\tan \alpha = \frac{|b|}{|a|} = \frac{3\sqrt{3}}{3} = \sqrt{3} \Rightarrow \alpha = \frac{\pi}{3}$$

$$\theta = \pi + \frac{\pi}{3} = \frac{4\pi}{3}$$

$$r = |z| = \sqrt{a^2 + b^2} = \sqrt{9 + 27} = \sqrt{36} = 6$$

$$z = r(\cos \theta + i \sin \theta) = 6 \left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3} \right)$$



KARMAŞIK DÜZLEMDE DÖRT İŞLEM OPERATIONS in the COMPLEX PLANE

$$z_1 = r_1 (\cos \theta_1 + i \sin \theta_1)$$

$$z_2 = r_2 (\cos \theta_2 + i \sin \theta_2)$$

$$1. z_1 \cdot z_2 = r_1 \cdot r_2 (\cos (\theta_1 + \theta_2) + i \sin (\theta_1 + \theta_2))$$

$$2. \frac{z_1}{z_2} = \frac{r_1}{r_2} (\cos (\theta_1 - \theta_2) + i \sin (\theta_1 - \theta_2))$$

Kompleks Sayıların Kuvveti / Powers of Complex Numbers:

Kompleks bir sayının kuvveti, DeMoivre teoremi olarak bilinen aşağıdaki denklemle bulunur.

For multiplication and division of complex numbers we get DeMoivre's theorem.

$$z = r(\cos \theta + i \sin \theta)$$

$$z^n = r^n (\cos n\theta + i \sin n\theta)$$

z nin çarpma işlemine göre tersi / Multiplication inverse of z:

$$z^{-1} = \frac{1}{z} = \frac{1}{a+bi} = \frac{a-bi}{(a+bi)(a-bi)}$$

$$z^{-1} = \frac{a-bi}{a^2+b^2} = \frac{a}{a^2+b^2} - \frac{b}{a^2+b^2}i$$

Örnek / Example 7:

$$z = \frac{\sqrt{3}}{2} - \frac{1}{2}i \Rightarrow z^{23} = ?$$

Çözüm / Solution:

$$z = \frac{\sqrt{3}}{2} - \frac{1}{2}i = \left(\frac{\sqrt{3}}{2}, -\frac{1}{2} \right) \text{ (IV. bölgede) (in quadrant IV)}$$

$$\tan \alpha = \frac{1}{\sqrt{3}} \Rightarrow \alpha = \frac{\pi}{6}$$

$$\theta = 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$$

$$r = |z| = \sqrt{\frac{3}{4} + \frac{1}{4}} = 1$$

$$z = 1 \left(\cos \frac{11\pi}{6} + i \sin \frac{11\pi}{6} \right)$$

$$z^{23} = 1^{23} \left(\cos \frac{23 \cdot 11\pi}{6} + i \sin \frac{23 \cdot 11\pi}{6} \right)$$

$$z^{23} = 1 \left(\cos \frac{253\pi}{6} + i \sin \frac{253\pi}{6} \right)$$

$$z^{23} = \cos \frac{\pi}{6} + i \sin \frac{\pi}{6} = \frac{\sqrt{3}}{2} + \frac{1}{2}i$$



BİR KARMAŞIK SAYININ KÖKLERİ ROOTS of a COMPLEX NUMBER

z bir karmaşık sayı ise

If z is a complex number, we have,

$$z = r (\cos(\theta + 2k\pi) + i \sin(\theta + 2k\pi)).$$

$$w_k = \sqrt[n]{z} = r^{\frac{1}{n}} \left(\cos \frac{1}{n}(\theta + 2k\pi) + i \sin \frac{1}{n}(\theta + 2k\pi) \right)$$

$$(k \in \{0, 1, 2, 3, \dots, n-1\})$$

İfadesine z nin n . kuvvetten kökleri denir.

The expression above is the n^{th} roots of z .

Örnek / Example 8:

$z = -2 + 2\sqrt{3}i$ karmaşık sayısının kare köklerini nedir?

What are the square roots of $z = ?$

Çözüm / Solution:

$$z = -2 + 2\sqrt{3}i = (-2, 2\sqrt{3}) \quad (\text{II. bölgede})$$

(quadrant II)

$$\tan \alpha = \frac{2\sqrt{3}}{-2} = -\sqrt{3} \Rightarrow \alpha = \frac{\pi}{3}$$

$$\theta = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$$

$$|z| = \sqrt{4+12} = \sqrt{16} = 4$$

$$w_k = \sqrt[n]{r} \left(\cos \frac{1}{n}(\theta + 2k\pi) + i \sin \frac{1}{n}(\theta + 2k\pi) \right)$$

$$w_k = \sqrt[4]{4} \left(\cos \frac{1}{2} \left(\frac{2\pi}{3} + 2k\pi \right) + i \sin \frac{1}{2} \left(\frac{2\pi}{3} + 2k\pi \right) \right)$$

$$w_0 = 2 \left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right)$$

$$w_1 = 2 \left(\cos \frac{1}{2} \left(\frac{2\pi}{3} + 2\pi \right) + i \sin \frac{1}{2} \left(\frac{2\pi}{3} + 2\pi \right) \right)$$

$$w_0 = 2 \left(\frac{1}{2} + i \frac{\sqrt{3}}{2} \right)$$

$$w_0 = 1 + \sqrt{3}i$$

$$w_1 = 2 \left(\cos \left(\frac{\pi}{3} + \pi \right) + i \sin \left(\frac{\pi}{3} + \pi \right) \right)$$

$$w_1 = 2 \left(-\cos \frac{\pi}{3} - i \sin \frac{\pi}{3} \right)$$

$$w_1 = -1 - \sqrt{3}i$$

i. z karmaşık sayısının kare köklerinden biri w_0 ise ikinci kök $w_1 = -w_0$ dir.

If one of the square roots of z is w_0 , then other root is $w_1 = -w_0$

ii. $z = a \pm bi$ karmaşık sayısının kare kökleri aşağıdaki formül ile bulunabilir.

The square roots of $z = a + bi$ can be found also by the following formula;

$$w_{0,1} = \pm \left(\sqrt{\frac{|z|+a}{2}} \pm i \sqrt{\frac{|z|-a}{2}} \right)$$

Örnek / Example 9:

$z = 5 - 12i$ karmaşık sayısının kare kökleri nedir?

What are the square roots of $z = 5 - 12i$?

Çözüm(Solution):

$$|z| = \sqrt{a^2 + b^2} = \sqrt{25 + 144} = \sqrt{169} = 13$$

$$w_{0,1} = \pm \left(\sqrt{\frac{|z|+a}{2}} - i \sqrt{\frac{|z|-a}{2}} \right)$$

$$w_{0,1} = \pm \left(\sqrt{\frac{13+5}{2}} - i \sqrt{\frac{13-5}{2}} \right)$$

$$w_{0,1} = \pm(3 - 2i)$$

$$w_0 = 3 - 2i, w_1 = -3 + 2i$$

Örnek / Example 10:

$$z_1 = (1 + i)^4, z_2 = (1 + \sqrt{3}i)^6 \Rightarrow \frac{z_1}{z_2} = ?$$

Çözüm / Solution:

$$z_1 = \left(\sqrt{2} \left(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right) \right)^4$$

$$z_2 = \left(2 \left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right) \right)^6$$

$$\frac{z_1}{z_2} = \frac{4(\cos \pi + i \sin \pi)}{64(\cos 2\pi + i \sin 2\pi)}$$

$$\frac{z_1}{z_2} = \frac{1}{16} (\cos(-\pi) + i \sin(-\pi))$$

$$\frac{z_1}{z_2} = \frac{1}{16} (\cos \pi - i \sin \pi)$$

$$\frac{z_1}{z_2} = \frac{1}{16} (-1 - 0) = -\frac{1}{16}$$

Örnek / Example 11:

$$3 + \bar{z} = (1 + 3i)z \Rightarrow z = ?$$

- A) $\frac{2}{3} - i$ B) $\frac{2}{3} + i$ C) $\frac{3}{2} - i$
D) $\frac{3}{2} + 2i$ E) $\frac{2}{3} + \frac{1}{2}i$

Çözüm / Solution:

$$z = a + bi \Rightarrow \bar{z} = a - bi$$

$$3 + a - bi = (1 + 3i)(a + bi)$$

$$3 + a - bi = a - 3b + (3a + b)i$$

$$\Rightarrow 3 + a = a - 3b \quad \wedge \quad -b = 3a + b$$

$$\Rightarrow b = -1 \quad \wedge \quad a = \frac{2}{3}$$

$$\Rightarrow z = \frac{2}{3} - i$$

Yanıt / Answer A

Örnek / Example 12:

$$z + 3i = \bar{z} \cdot 4i \Rightarrow z = ?$$

- A) $\frac{1}{3} - \frac{4}{3}i$ B) $\frac{1}{2} + \frac{3}{2}i$ C) $\frac{4}{5} + \frac{1}{5}i$
D) $\frac{8}{9} - \frac{1}{9}i$ E) $\frac{3}{7} - \frac{1}{7}i$

Çözüm / Solution:

$$z = a + bi \Rightarrow \bar{z} = a - bi$$

$$a + (b + 3)i = (a - bi) \cdot 4i$$

$$a + (b + 3)i = 4b + 4ai$$

$$\Rightarrow a = 4b \quad \wedge \quad b + 3 = 4a$$

$$\Rightarrow a = \frac{4}{5} \quad \wedge \quad b = \frac{1}{5}$$

$$\Rightarrow z = \frac{4}{5} + \frac{1}{5}i$$

Yanıt / Answer C

Örnek / Example 13:

$$(1 + i)^5 + (1 - i)^5 + i^{25} = ?$$

- A) $4 - i$ B) $i - 8$ C) $8 + i$
D) $8i - 1$ E) $1 + 8i$

Çözüm / Solution:

$$(1 + i)^5 + (1 - i)^5 + i^{25}$$

$$= ((1 + i)^2)^2 (1 + i) + ((1 - i)^2)^2 (1 - i) + i$$

$$= (2i)^2 (1 + i) + (-2i)^2 (1 - i) + i$$

$$= -4(1 + i) + (-4)(1 - i) + i$$

$$= -4 - 4i - 4 + 4i + i = -8 + i$$

Yanıt / Answer B

Örnek / Example 14:

$$(1 + i)z = \bar{z} + 1 \Rightarrow z = ?$$

- A) $2 + 3i$ B) $2 + i$ C) $3 + i$
D) $2 - i$ E) $3 - i$

(YÖS 2007)

Çözüm / Solution:

$$(1 + i)z = \bar{z} + 1$$

$$z = a + bi$$

$$\bar{z} = a - bi$$

$$(1 + i)(a + bi) = (a - bi) + 1$$

$$a + bi + ai - b = a - bi + 1$$

$$a - b = a + 1$$

$$b = -1$$

$$(a + b)i = -bi$$

$$a + b = -b$$

$$a = -2b \Rightarrow a = 2 \Rightarrow z = a + bi = 2 - i$$

Yanıt / Answer D

1. $z = (12 - 5i) \cdot (7 + 24i) \Rightarrow |z| = ?$

Yanıt / Answer : 325

2. $z = 3 - 2i \Rightarrow |z \cdot \bar{z}| = ?$

Yanıt / Answer : 13

3. $(1 + i)^{14} = ?$

Yanıt / Answer : $-128i$

4. $z = \frac{1+3i}{2i} \Rightarrow z^{-1} = ?$

Yanıt / Answer : $\frac{3}{5} + \frac{i}{5}$

5. $z = 3 - 3\sqrt{3}i \Rightarrow z^{12} = ?$

Yanıt / Answer : 6^{12}

6. $i^{48} \cdot i^{16} \cdot i^{-1} = ?$

Yanıt / Answer : $-i$

7. $z = i^{85} + i^{23} - i^{41} - i^9 \Rightarrow z = ?$

Yanıt / Answer : $-2i$

8. $z_1 = \text{cis} \frac{2\pi}{3}$ ve (and) $z_2 = \text{cis} \frac{4\pi}{3} \Rightarrow z_1 \cdot z_2 = ?$

Yanıt / Answer : 1

9. $z = \frac{(1+i)(2-i)}{4+3i} \Rightarrow |z| = ?$

Yanıt / Answer : $\frac{\sqrt{10}}{5}$

10. $z = 3 - 4i \Rightarrow w_1 = ?$

Yanıt / Answer : $i - 2$

11. $z = \frac{1-3i}{3+i} \Rightarrow \text{Im}(z) = ?$

Yanıt / Answer : -1

12. $z = -1 + \sqrt{3}i \Rightarrow w_1 = ?$

Yanıt / Answer : $\frac{\sqrt{2}}{2} + \frac{\sqrt{6}}{2}$

13. $z = (\sqrt{3} - \sqrt{3}i)^{60} = ?$

Yanıt / Answer : -6^{30}

14. $z \cdot (1+i) = z + 4 + 3i \Rightarrow \text{Re}(z) \cdot \text{Im}(z) = ?$

Yanıt / Answer : -12

15. $z = a + bi,$
 $3z - 5 \leq 1 + 3i \Rightarrow a - 2b = ?$

Yanıt / Answer : 0

16. $\left. \begin{array}{l} f: \mathbb{C} \rightarrow \mathbb{C}, f(z) = z^2 + \bar{z} \\ g: \mathbb{C} \rightarrow \mathbb{C}, g(z) = 1 + iz \end{array} \right\} \Rightarrow (f \circ g)(1+i) = ?$

Yanıt / Answer : $-1 - i$

1. $i = \sqrt{-1} \Rightarrow i^{45} + i = ?$

- A)
- $i - 1$
- B) 0 C)
- $i + 1$
- D)
- $2i$
- E)
- $1 - i$

2. $n \in \mathbb{N}^+$

$i^2 = -1 \Rightarrow i^{171} - i^{4n+2} = ?$

- A)
- $1 - i$
- B) 0 C)
- $-1 - i$
- D)
- $-2i$
- E)
- $2i$

3. $i^2 = -1 \Rightarrow (i^{175} - i^{86})^6 = ?$

- A)
- $-8i$
- B)
- $8i$
- C)
- -8
- D) 8 E)
- $16i$

4. $(1 + i)^9 + (1 - i)^{11} = ?$

- A)
- $-48i$
- B)
- -48
- C)
- $16 \cdot (1 + i)$
-
- D)
- $-16 \cdot (1 + i)$
- E)
- $16 \cdot (1 - i)$

5. $(1 + i)^{11} - (1 - i)^{11} = ?$

- A) 64 B)
- $64i$
- C) 0 D)
- -64
- E)
- $-64i$

6. $\frac{(1+i)^{36}}{(1-i)^{24}} = ?$

- A)
- -64
- B) 64 C)
- $64i$
- D)
- $-64i$
- E) 16

7. $i^2 = -1 \Rightarrow \left(\frac{1+i}{1-i}\right)^{42} = ?$

- A)
- $4i$
- B)
- $-2i$
- C)
- $-i$
- D) 1 E)
- -1

8. $\left(\frac{1-i}{1+i}\right)^{23} \cdot i = ?$

- A)
- $2i$
- B)
- -1
- C)
- $-2i$
- D) 1 E) 2

9. $(1 - i^9) \cdot (1 + i^{17}) + (1 + i^{49}) \cdot (1 + i^{23}) = ?$

- A) 0 B)
- $4i$
- C) 4 D)
- -4
- E)
- $-4i$

10. $i^2 = -1 \Rightarrow (1 + i^5) \cdot (1 + i^7) \cdot (1 + i^9) \cdot (1 + i^{18}) = ?$

- A)
- -2
- B) 4 C)
- $1 + i$
- D)
- $1 - i$
- E)
- $-4i$

11. $z = 2 + i \Rightarrow |z^{-1}| = ?$

- A) 2 B) $\frac{\sqrt{3}}{3}$ C) $\frac{\sqrt{5}}{5}$ D) $\frac{3}{2}$ E) $\frac{5}{3}$

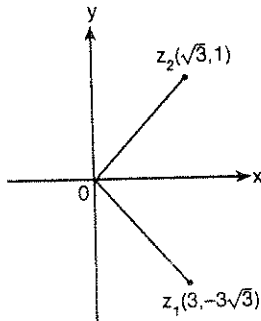
12. $z(2+i) + \bar{z} = 5 + 7i \Rightarrow z = ?$

- A) $3 + 2i$ B) $4 + 3i$ C) $6 + 5i$
D) $3 + 4i$ E) $3 - 4i$

13. $z_1 = (3 - 4i), z_2 = 2 + i \Rightarrow \frac{z_1}{z_2} = ?$

- A) $\frac{4+7i}{6}$ B) $\frac{5-9i}{5}$ C) $\frac{2-11i}{5}$
D) $\frac{1-5i}{4}$ E) $\frac{4-11i}{5}$

14.



$z_1(3, -3\sqrt{3}),$

$z_2(\sqrt{3}, 1) \Rightarrow \frac{z_1}{z_2} = ?$

- A) $3 + i$ B) $-3 - i$ C) $3i$
D) $-3i$ E) $-2i$

15. $z = -\frac{1}{2} + \frac{\sqrt{3}}{2}i \Rightarrow w = z^{59} = ?$

- A) $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$ B) $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ C) $\frac{1}{2} - \frac{\sqrt{3}}{2}i$
D) $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$ E) $-\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}i$

16. $z = -4 + 4\sqrt{3}i = ?$

- A) $4\left(\cos \frac{5\pi}{3} + i \sin \frac{5\pi}{3}\right)$
B) $8\left(\cos \frac{5\pi}{3} + i \sin \frac{5\pi}{3}\right)$
C) $4\left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3}\right)$
D) $8\left(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6}\right)$
E) $8\left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3}\right)$

17. $|z| \leq 4 \Rightarrow (\min)(|z - 5 - 12i|) = ?$

- A) 17 B) 15 C) 14 D) 9 E) 7

18. $z + 4i = iz - 8 \Rightarrow z = ?$

- A) $-2 - 6i$ B) $-2 + 6i$ C) $2 - 6i$
D) $4 - 3i$ E) $3 - 4i$

19. $(1-i)z + i\bar{z} = 5 + i \Rightarrow |z| = ?$

- A) $2\sqrt{5}$ B) $\sqrt{10}$ C) $3\sqrt{2}$ D) $5\sqrt{3}$ E) $2\sqrt{15}$

20. $z = (1 + 7i) \cdot (2 - 6i) \Rightarrow |z| = ?$

- A) $10\sqrt{5}$ B) $15\sqrt{2}$ C) $20\sqrt{2}$
D) $16\sqrt{5}$ E) $20\sqrt{5}$

Yanıtlar / Answers

1. D	2. A	3. B	4. D	5. B	6. A	7. E	8. B
9. C	10. B	11. C	12. D	13. C	14. D	15. A	16. E
17. D	18. A	19. B	20. E				

1. $i = \sqrt{-1}$
 $z = i^{72} - i^{67} + i^{248}$
 $\Rightarrow z = ?$
 A) i B) 1 C) -1 D) $2 - i$ E) $2 + i$
2. $i = \sqrt{-1}$
 $z = (1 - i)^{17} - (1 + i)^{17}$
 $\Rightarrow z = ?$
 A) $-512i$ B) 512 C) $256i$
 D) 256 E) $-64i$
3. $i = \sqrt{-1}$
 $z = (1 + i^{15})^2 (1 - i^{23})^4 + (1 - i)(1 + i^{17})$
 $\Rightarrow z = ?$
 A) $6i$ B) $4i + 1$ C) $2(1 + 4i)$
 D) $8 + i$ E) $16 - i$
4. $z_1 = (3 - 4i)$, $z_2 = 2 + i \Rightarrow \frac{z_1}{z_2} = ?$
 A) $\frac{4+7i}{6}$ B) $\frac{5-9i}{5}$ C) $\frac{2-11i}{5}$
 D) $\frac{1-5i}{4}$ E) $\frac{4-11i}{5}$
5. $4a + 6(2 - i) = 4b + 2 + 2(3 - b)i$
 $\Rightarrow a + b = ?$
 A) -16 B) -4 C) 0 D) $\frac{17}{2}$ E) $\frac{19}{2}$
6. $i = \sqrt{-1}$
 $z \cdot (2 - i) = 7 - i$
 $\Rightarrow z = ?$
 A) $3 - i$ B) $6 + i$ C) $3 + i$
 D) $2 + i$ E) $5 - i$
7. $|z| - \bar{z} = 2 + 2\sqrt{3}i$
 $\Rightarrow z = ?$
 A) $2 - \sqrt{3}i$ B) $2(1 + \sqrt{3}i)$ C) $2(1 - \sqrt{3}i)$
 D) $2(\sqrt{3} - i)$ E) $2(\sqrt{3} + i)$
8. $z = 1 + \sqrt{3}i$
 $\Rightarrow \left(\frac{z - \bar{z}}{z + z} \right)^8 = ?$
 A) 81 B) 27 C) 9 D) $\frac{1}{27}$ E) $\frac{1}{81}$
9. $z = \frac{1}{2} + \frac{\sqrt{3}}{2}i$, $z_2 = 2 - 2\sqrt{3}i$
 $\Rightarrow |z_1 z_2|^2 = ?$
 A) 4 B) 16 C) 64 D) 36 E) 216
10. $i^2 = -1$
 $\Rightarrow (1 + i)^9 + (1 - i)^9 = ?$
 A) $-32i$ B) -32 C) $32i$ D) 32 E) 0

11. $z \cdot (1+i) = 5+i$

$\Rightarrow z^{-1} = ?$

A) $\frac{1}{7} + \frac{3}{7}i$ B) $\frac{3}{11} - \frac{2}{11}i$ C) $\frac{3}{13} + \frac{2}{13}i$

D) $-\frac{2}{13} + \frac{3}{13}i$ E) $\frac{2}{3} - \frac{\sqrt{2}}{3}i$

12. $|z| + (\bar{z}) = 8 - 4i$

$\Rightarrow z = ?$

A) $-3 - 4i$ B) $4 + 3i$ C) $5 - 4i$

D) $-\sqrt{3} + 3\sqrt{3}i$ E) $3 - 4i$

13. $z = \frac{3+2i}{1-i} + \frac{4}{2+i} \Rightarrow \text{Re}(z) = ?$

A) $\frac{9}{5}$ B) $\frac{17}{5}$ C) $\frac{17}{10}$ D) $\frac{21}{10}$ E) $-\frac{21}{5}$

14. $z \cdot (2+i) = 6 + 13i \Rightarrow \text{Im}(z) = ?$

A) 6 B) 5 C) 4 D) $\frac{3}{5}$ E) $\frac{2}{9}$

15. $z_1 = 1 - i,$

$z_2 = -1 + \sqrt{3}i,$

$z_3 = -3 - 3\sqrt{3}i$

$\Rightarrow \text{Arg}(z_1 \cdot z_2 \cdot z_3) = ?$

A) $\frac{7\pi}{4}$ B) $\frac{5\pi}{3}$ C) $\frac{5\pi}{4}$ D) $\frac{7\pi}{6}$ E) $\frac{3\pi}{5}$

16. $z_1 = 2 - 2\sqrt{3}i,$

$z_2 = 1 + i,$

$z_3 = 3i$

$\Rightarrow \text{Arg}\left(\frac{z_1}{z_2 \cdot z_3}\right) = ?$

A) $\frac{\pi}{4}$ B) $\frac{5\pi}{3}$ C) $\frac{5\pi}{4}$ D) $\frac{7\pi}{12}$ E) $\frac{11\pi}{12}$

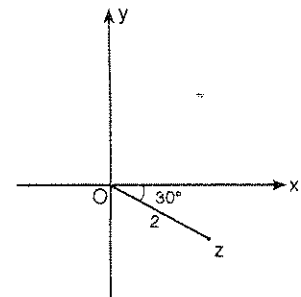
17. $z \in \mathbb{C}, |z| \leq 5$

$\Rightarrow \max(|z + 8 - 15i|) = ?$

A) 12 B) 17 C) 22 D) 24 E) 26

18. $|z| = 2$

$\Rightarrow z^5 = ?$



A) $32(\sqrt{3} - i)$

B) $16(\sqrt{3} - i)$

C) $16(-\sqrt{3} + i)$

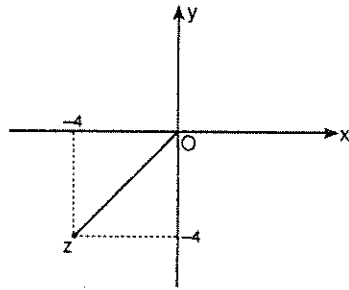
D) $16(-\sqrt{3} - i)$

E) $8(1 + i)$

Yanıtlar / Answers

1. E	2. A	3. C	4. C	5. E	6. C	7. B	8. A
9. B	10. A	11. C	12. E	13. D	14. C	15. A	16. E
17. C	18. D						

1. $\Rightarrow z = ?$



A) $4\sqrt{2} \left(\cos \frac{5\pi}{3} + i \sin \frac{5\pi}{3} \right)$

B) $4 \left(\cos \frac{11\pi}{6} + i \sin \frac{11\pi}{6} \right)$

C) $4\sqrt{2} \left(\cos \frac{5\pi}{4} + i \sin \frac{5\pi}{4} \right)$

D) $4 \left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right)$

E) $2\sqrt{3} \left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3} \right)$

2. $z = 1 + i$

$\Rightarrow (z)^{29} = ?$

A) $2^{13}(-1 + i)$ B) $-2^{14}(1 + i)$ C) $2^{14}(1 - i)$

D) $2^{13}(1 + i)$ E) $2^{15}(1 - i)$

3. $z = \frac{4-3i}{1-i} + \frac{2}{2+i} \Rightarrow \operatorname{Re}(z) = ?$

A) $\frac{1}{5}$ B) $\frac{3}{10}$ C) $\frac{17}{43}$ D) $\frac{43}{10}$ E) $\frac{51}{8}$

4. $z = \frac{3-4i}{1+i} + \frac{4}{2-i} \Rightarrow \operatorname{Im}(z) = ?$

A) $\frac{21}{10}$ B) $\frac{9}{5}$ C) $\frac{4}{5}$ D) $-\frac{17}{10}$ E) $-\frac{27}{10}$

5. $z = \frac{(3+4i) \cdot (-1+2i)}{(-1-i) \cdot (3-i)} \Rightarrow |z| = ?$

A) 5 B) 4 C) 3 D) $\frac{5}{2}$ E) 2

6. $z + 4i = iz - 8$

$\Rightarrow z = ?$

A) $-2 - 6i$ B) $-2 + 6i$ C) $2 - 6i$

D) $4 - 3i$ E) $3 - 4i$

7. $z = \frac{1}{4-i} - \frac{1}{1-4i} \Rightarrow \operatorname{Re}(z) = ?$

A) $\frac{2}{11}$ B) $\frac{3}{17}$ C) $-\frac{3}{17}$ D) $-\frac{5}{11}$ E) $-\frac{1}{3}$

8. $z = \frac{1}{2-3i} \Rightarrow \operatorname{Im}(z^2) = ?$

A) $\frac{12}{169}$ B) $\frac{3}{13}$ C) $\frac{5}{169}$ D) $-\frac{5}{169}$ E) $-\frac{12}{169}$

9. $z_1 = 2 + i, z_2 = 7 + 3i \Rightarrow \operatorname{Im}\left(\frac{z_2}{z_1}\right) = ?$

A) $\frac{1}{5}$ B) $\frac{17}{5}$ C) $\frac{16}{5}$ D) 3 E) $-\frac{1}{5}$

10. $z \cdot (6 + 5i) - z = 15 + 5i$

$\Rightarrow z = ?$

- A) $3 + i$ B) $3 - i$ C) $4 + i$
D) $2 - i$ E) $2 + i$

11. $|z| + z = 8 - 4i$

$\Rightarrow z = ?$

- A) $3 - 4i$ B) $-3 + 4i$ C) $3 + 5i$
D) $4 - 3i$ E) $6 - i$

12. $z = (1 + 7i) \cdot (2 - 6i) \Rightarrow |z| = ?$

- A) $10\sqrt{5}$ B) $15\sqrt{2}$ C) $20\sqrt{2}$
D) $16\sqrt{5}$ E) $20\sqrt{5}$

13. $\frac{2+i}{2-i} \cdot z = 2i - z \Rightarrow z = ?$

- A) $1 + i$ B) $\frac{1}{2} - i$ C) $\frac{1}{2} - \frac{1}{2}i$
D) $1 - i$ E) $\frac{1}{2} + i$

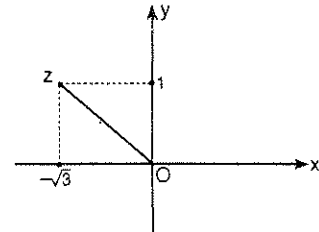
14. $\frac{i^{55} - 4 \cdot i^{37} + 3 \cdot i^{72}}{2 + i^{131}} = ?$

- A) $\frac{2}{5} - \frac{11}{5}i$ B) $\frac{3}{5} + \frac{13}{5}i$
C) $\frac{11}{5} - \frac{7}{5}i$ D) $\frac{1}{7} - \frac{11}{7}i$
E) $\frac{3}{10} - \frac{17}{10}i$

15. $z = 4 \cdot \text{cis } \frac{11\pi}{6} = ?$

- A) $2 - 2\sqrt{3}i$ B) $2 + 2\sqrt{3}i$ C) $-2\sqrt{3} + 2i$
D) $\sqrt{3} - i$ E) $2\sqrt{3} - 2i$

16. $\Rightarrow z = ?$



A) $\sqrt{2} \cdot \left(\cos \frac{13\pi}{12} + i \sin \frac{13\pi}{12} \right)$

B) $\sqrt{2} \cdot \left(\cos \frac{5\pi}{12} + i \sin \frac{5\pi}{12} \right)$

C) $2 \cdot \left(\cos \frac{5\pi}{12} + i \sin \frac{5\pi}{12} \right)$

D) $\sqrt{2} \cdot \left(\cos \frac{21\pi}{12} + i \sin \frac{21\pi}{12} \right)$

E) $2 \cdot \left(\cos \frac{11\pi}{12} + i \sin \frac{11\pi}{12} \right)$

17. $\frac{2z}{1+i} - \frac{2z}{i} = \frac{5}{2+i} \Rightarrow z = ?$

- A) $\frac{3}{2} - \frac{1}{2}i$ B) $\frac{3}{4} + \frac{1}{2}i$ C) $\frac{1}{2} + 2i$
D) $\frac{1}{3} - \frac{2}{3}i$ E) $\frac{1}{2} - \frac{3}{2}i$

18. $|z| = 6 \Rightarrow \left| \bar{z} - \frac{6}{z} \right| = ?$

- A) 4 B) 5 C) $\frac{16}{3}$ D) $\frac{8}{3}$ E) $\frac{3}{2}$

Yanıtlar / Answers

1. C	2. B	3. D	4. E	5. D	6. A	7. E	8. A
9. B	10. D	11. A	12. E	13. E	14. C	15. E	16. B
17. E	18. B						



TOPLAM / THE SUM ($\sum$)

$a_k \in \mathbb{R}$, $p, n \in \mathbb{N}^+$ ve $p \leq n$ olmak üzere,

$$\sum_{k=p}^n a_k = a_p + a_{p+1} + a_{p+2} + \dots + a_n \text{ dir.}$$

If $a_k \in \mathbb{R}$, $p, n \in \mathbb{N}^+$ and $p \leq n$ then:

$$\sum_{k=p}^n a_k = a_p + a_{p+1} + a_{p+2} + \dots + a_n$$

Örnek / Example 1:

$$\sum_{k=1}^6 a_k = a_1 + a_2 + a_3 + a_4 + a_5 + a_6$$

Örnek / Example 2:

$$\sum_{k=3}^7 a_k = a_3 + a_4 + a_5 + a_6 + a_7$$

Örnek / Example 3:

$$\sum_{k=3}^5 (3k-8) = ?$$

Çözüm / Solution:

$$\begin{aligned} \sum_{k=3}^5 (3k-8) &= (3 \cdot 3 - 8) + (3 \cdot 4 - 8) + (3 \cdot 5 - 8) \\ &= (9-8) + (12-8) + (15-8) \\ &= 1+4+7=12 \end{aligned}$$

Örnek / Example 4:

$$\sum_{i=1}^4 2^i = ?$$

Çözüm(Solution):

$$\begin{aligned} \sum_{i=1}^4 2^i &= 2^1 + 2^2 + 2^3 + 2^4 \\ &= 2+4+8+16=30 \end{aligned}$$



($\sum$) SEMBOL İLE İLGİLİ ÖZELLİKLER
PROPERTIES of SYMBOLS ($\sum$)

$$1. \sum_{k=1}^n a_k = \sum_{p=1}^n a_p = \sum_{i=1}^n a_i = \dots$$

$$2. \sum_{k=1}^n (a_k \pm b_k) = \sum_{k=1}^n a_k \pm \sum_{k=1}^n b_k$$

$$3. \sum_{k=1}^n c \cdot a_k = c \sum_{k=1}^n a_k$$

$$4. \sum_{k=1}^n c = n \cdot c$$

$$5. \sum_{k=1}^n a_k = \sum_{k=1}^p a_k + \sum_{k=p+1}^n a_k$$

$$6. \sum_{k=p}^n a_k = \sum_{k=p \pm r}^{n \pm r} a_{(k \mp r)}$$

Örnek / Example 5:

$$\sum_{k=1}^9 7 = 9 \cdot 7 = 63$$

Örnek / Example 6:

$$\begin{aligned} \sum_{k=3}^6 2k &= \sum_{k=1}^4 2(k+2) = 2(1+2) + 2(2+2) + 2(3+2) + 2(4+2) \\ &= 6+8+10+12=36 \end{aligned}$$

Örnek / Example 7:

$$\begin{aligned}\sum_{k=-2}^1 (3k+2) &= \sum_{k=1}^4 ((3(k-3)+2)) \\ &= \sum_{k=1}^4 (3k-7) \\ &= (3 \cdot 1 - 7) + (3 \cdot 2 - 7) + (3 \cdot 3 - 7) + (3 \cdot 4 - 7) \\ &= -4 - 1 + 2 + 5 \\ &= 2\end{aligned}$$



ÖNEMLİ BAZI TOPLAM FORMÜLLERİ

SOME IMPORTANT SUMMATION FORMULAS

1. $\sum_{k=1}^n k = \frac{n \cdot (n+1)}{2}$
2. $\sum_{k=1}^n (2k) = n \cdot (n+1)$
3. $\sum_{k=1}^n (2k-1) = n^2$
4. $\sum_{k=1}^n k^2 = \frac{n(n+1) \cdot (2n+1)}{6}$
5. $\sum_{k=1}^n k^3 = \left[\frac{n(n+1)}{2} \right]^2$
6. $\sum_{k=1}^n k(k+1) = \frac{n(n+1)(n+2)}{3}$
7. $\sum_{k=1}^n \frac{1}{k(k+1)} = \frac{n}{n+1}$
8. $\sum_{k=1}^n r^{k-1} = \frac{1-r^n}{1-r}$
9. $\sum_{k=1}^n \frac{k}{(k+1)!} = 1 - \frac{1}{(n+1)!}$
10. $\sum_{k=1}^n k \cdot k! = (n+1)! - 1, n \in \mathbb{N}^+$
11. $\sum_{k=1}^n \frac{k-1}{k!} = 1 - \frac{1}{n!}, n \in \mathbb{N}^+$

Örnek / Example 8:

$$\sum_{k=-5}^9 2k = ?$$

Çözüm / Solution:

$$\begin{aligned}\sum_{k=-5}^9 2k &= \sum_{k=1}^{15} 2(k-6) \\ &= 2 \sum_{k=1}^{15} k - \sum_{k=1}^{15} 12 \\ &= 2 \cdot \frac{15 \cdot 16}{2} - 12 \cdot 15 \\ &= 240 - 180 = 60\end{aligned}$$

Örnek / Example 9:

$$f(k) = 2k + 1 \Rightarrow$$

$$\sum_{n=1}^{10} [f(n)]^2 = ?$$

Çözüm / Solution:

$$\begin{aligned}\sum_{n=1}^{10} [f(n)]^2 &= \sum_{n=1}^{10} (4n^2 + 4n + 1) \\ &= 4 \sum_{n=1}^{10} n^2 + 4 \sum_{n=1}^{10} n + \sum_{n=1}^{10} 1 \\ &= 4 \cdot \frac{10 \cdot 11 \cdot 21}{6} + 4 \cdot \frac{10 \cdot 11}{2} + 10 \\ &= 4 \cdot 5 \cdot 11 \cdot 7 + 220 + 10 \\ &= 20 \cdot 77 + 230 \\ &= 1540 + 230 \\ &= 1770\end{aligned}$$

Örnek / Example 10:

$$\sum_{i=1}^3 \left(\sum_{j=-2}^3 (2k+3j+2) \right) = ?$$

Çözüm / Solution:

$$\begin{aligned} \sum_{i=1}^3 \left(\sum_{j=-2}^3 (2k+3j+2) \right) &= \sum_{i=1}^3 \left(\sum_{j=1}^6 (2k+3j-9+2) \right) \\ &= \sum_{i=1}^3 \left(12k+3 \cdot \frac{6 \cdot 7}{2} - 42 \right) = \sum_{i=1}^3 (12k+21) \\ &= 12 \cdot \frac{3 \cdot 4}{2} + 63 = 72 + 63 \\ &= 135 \end{aligned}$$

Örnek / Example 11:

$$f(x) = x + 1, x_1 = 2, x_2 = 3, x_3 = 5$$

$$\sum_{i=1}^3 (x_i - 1) f(x_i) = ?$$

Çözüm / Solution:

$$\begin{aligned} \sum_{i=1}^3 (x_i - 1) f(x_i) &= (x_1 - 1)f(x_1) + (x_2 - 1)f(x_2) + (x_3 - 1)f(x_3) \\ &= (2-1)f(2) + (3-1)f(3) + (5-1)f(5) \\ &= 1 \cdot 3 + 2 \cdot 4 + 3 \cdot 6 \\ &= 29 \end{aligned}$$



ÇARPIM SEMBOLÜ / MULTIPLICATION SYMBOL (Π)

$$\prod_{k=p}^n a_k = a_p \cdot a_{p+1} \cdot a_{p+2} \cdot \dots \cdot a_n$$

Örnek / Example 12:

$$\prod_{k=2}^3 2k = (2 \cdot 2) \cdot (2 \cdot 3) = 24$$

Örnek / Example 13:

$$\prod_{k=2}^5 2^k = 2^2 \cdot 2^3 \cdot 2^4 \cdot 2^5 = 2^{14}$$



ÇARPIM SEMBOLÜNÜN (Π) KULLANIMI İLE İLGİLİ

ÖZELLİKLER

PROPERTIES RELATED to MULTIPLICATION SYMBOL (Π)

$$1. \prod_{k=1}^n a_k = \prod_{i=1}^n a_i = \prod_{p=1}^n a_p$$

$$2. \prod_{k=1}^n (a_k \cdot b_k) = \prod_{k=1}^n a_k \cdot \prod_{k=1}^n b_k$$

$$3. \prod_{k=1}^n (ca_k) = (c^n) \cdot \prod_{k=1}^n a_k$$

$$4. \prod_{k=p}^n a_k = \prod_{k=p-r}^{n-r} a_{k+r} = \prod_{k=p+r}^{n+r} a_{k-r}$$

$$5. \prod_{k=1}^n a_k = \prod_{k=1}^p a_k \cdot \prod_{k=p+1}^n a_k$$

$$6. \prod_{k=p+1}^n a_k = \frac{\prod_{k=1}^n a_k}{\prod_{k=1}^p a_k}$$

Örnek / Example 14:

$$\prod_{k=1}^3 (k \cdot 3^k) = ?$$

$$\begin{aligned} \prod_{k=1}^3 (k \cdot 3^k) &= 1 \cdot 3^1 \cdot 2 \cdot 3^2 \cdot 3 \cdot 3^3 \\ &= 3 \cdot 18 \cdot 81 \\ &= 54 \cdot 81 \\ &= 4374 \end{aligned}$$

Örnek / Example 15:

$$\prod_{k=1}^8 2 = ?$$

Çözüm / Solution:

$$\prod_{k=1}^8 2 = 2^8 = 256$$



BAZI ÖNEMLİ ÇARPIM FORMÜLLERİ
SOME IMPORTANT MULTIPLICATION FORMULAS

1. $\prod_{k=1}^n k = n!$

2. $\prod_{k=p}^n \log_k (k+1) = \log_p (n+1)$

Örnek / Example 16:

$$\prod_{k=5}^{10} \log_k (k+1) = ?$$

Çözüm / Solution:

$$\begin{aligned} & \prod_{k=5}^{10} \log_k (k+1) \\ &= \log_5 6 \cdot \log_6 7 \cdot \log_7 8 \cdot \log_8 9 \cdot \log_9 10 \cdot \log_{10} 11 \\ &= \log_5 6 \cdot \frac{\log_5 7}{\log_5 6} \cdot \frac{\log_5 8}{\log_5 7} \cdot \frac{\log_5 9}{\log_5 8} \cdot \frac{\log_5 10}{\log_5 9} \cdot \frac{\log_5 11}{\log_5 10} \\ &= \log_5 11 \end{aligned}$$

3. $\prod_{k=1}^n r^k = r^{\frac{n(n+1)}{2}}$

Örnek / Example 17:

$$\prod_{k=3}^{80} \log_k (k+1) = ?$$

Çözüm / Solution:

$$\begin{aligned} & \prod_{k=3}^{80} \log_k (k+1) \\ &= \log_3 4 \cdot \log_4 5 \cdot \log_5 6 \cdot \dots \cdot \log_{79} 80 \cdot \log_{80} 81 \\ &= \log_3 4 \cdot \frac{\log_3 5}{\log_3 4} \cdot \frac{\log_3 6}{\log_3 5} \cdot \dots \cdot \frac{\log_3 80}{\log_3 79} \cdot \frac{\log_3 81}{\log_3 80} \\ &= \log_3 81 = \log_3 3^4 = 4 \end{aligned}$$

4. $\prod_{i=2}^n \left(\frac{i^2-1}{i^2} \right) = \frac{n+1}{2n}$

Örnek / Example 18:

$$\sum_{k=-1}^2 (10k-5) = ?$$

- A) -5 B) 0 C) 15 D) 20 E) 30

(YÖS 2006)

Çözüm / Solution:

$$\begin{aligned} \sum_{k=-1}^2 (10k-5) &= 10 \cdot \sum_{k=-1}^2 k - \sum_{k=-1}^2 5 \\ &= 10 \cdot (-1+0+1+2) - (5 \cdot 4) \\ &= 2 \cdot 10 - 20 \\ &= 0 \end{aligned}$$

Yanıt / Answers B

Örnek / Example 19:

$$\sum_{k=1}^{78} \log_3 \left(\frac{k+3}{k+2} \right) = ?$$

- A) 1 B) 3 C) 9 D) 78 E) 81

(YÖS 2007)

Çözüm / Solution:

$$\begin{aligned} \sum_{k=1}^{78} \log_3 \left(\frac{k+3}{k+2} \right) &= \log_3 \left(\frac{4}{3} \right) + \log_3 \left(\frac{5}{4} \right) + \dots + \log_3 \left(\frac{81}{80} \right) \\ &= \log_3 \left(\frac{4}{3} \cdot \frac{5}{4} \cdot \dots \cdot \frac{81}{80} \right) \\ &= \log_3 \frac{81}{3} = \log_3 27 = \log_3 3^3 = 3 \end{aligned}$$

Yanıt / Answer B



DİZİLER / SEQUENCES

Tanım: $f: N^+ \rightarrow R$, $f(n) = a_n$ biçiminde tanımlı her fonksiyona **dizi** denir.

$n = 1, 2, 3, 4 \dots$ sayılarına karşılık gelen

$f(1) = a_1, f(2) = a_2, f(3) = a_3, \dots, f(n) = a_n$ reel sayılarına **dizinin terimleri** denir. $f(n) = a_n$ reel sayısına da dizinin **genel terimi** denir.

$f(1) = a_1, f(2) = a_2, \dots, f(n) = a_n$ ise

f dizisi genel olarak $(a_1, a_2, a_3, \dots, a_n, \dots)$ veya kısaca (a_n) ile gösterilir.

Definition: A function which is defined in the form;

$f: N^+ \rightarrow N$, $f(n) = a_n$ is called a sequence.

The real numbers $f(1) = a_1, \dots, f(n) = a_n$ which correspond to the numbers. $n = 1, 2, 3, 4 \dots$ are called the terms of the sequence. $f(n) = a_n$ is called the general term of the sequence.

Let $f(1) = a_1, f(2) = a_2, \dots, f(n) = a_n$.

The sequence is denoted by $(a_1, a_2, a_3, \dots, a_n, \dots)$ in general or it is denoted by (a_n) , briefly.

Örnek / Example:

$\left(\frac{n+6}{n^2-1} \right)$ dizisinin 4. terimi kaçtır?

What is the fourth term of the sequence $\left(\frac{n+6}{n^2-1} \right)$

Çözüm / Solution:

$$\frac{4+6}{16-1} = \frac{10}{15} = \frac{2}{3}$$



SERİLER

(a_n) bir reel terimli dizi olmak üzere, genel terimi,

$$(S_n) = a_1 + a_2 + a_3 + \dots + a_n$$

olan (S_n) dizisi gözönüne alınırsa $((a_n), (S_n))$ sıralı ikilisine bir **seri** denir. (a_n) terimine serinin genel terimi, (S_n) dizisine de serinin **kısmi toplamlar dizisi** adı verilir. Eğer (S_n) bir S sayısına yakınsıyor ise yani; $\lim S_n = S$ ise $((a_n), (S_n))$ serisi yakınsak ve toplamı S dir. Yakınsak olmayan seriye **ıraksak seri** denir.

$\sum_{n=1}^{\infty} a_k$ bir seridir ve bu seri yakınsak ise $\sum_{n=1}^{\infty} a_k = S$ dir.

$\sum_{n=1}^{\infty} a \cdot r^{n-1}$ serisine **geometrik seri** denir.

$|r| < 1$ ise seri yakınsaktır. Yakınsak bir geometrik serinin toplamı parça toplamı dizisinin limitine eşittir.

$\sum a \cdot r^n$ yakınsak seri olmak üzere

ilk terimi $a_p = a \cdot r^p$, ortak farkı r ise

$$\sum_{n=p}^{\infty} a \cdot r^n = \frac{a \cdot r^p}{1-r} \text{ dir.}$$



SERIES

Provided that (a_n) is a sequence, the terms of which is real number, let (S_n) be the sequence with the general term.

$$(S_n) = a_1 + a_2 + a_3 + \dots + a_n$$

Then the ordered pair $((a_n), (S_n))$ is called a series and is called the general term of the series and (S_n) is called the partial sum sequence of the series. If (S_n) approaches a number S , that means if $\lim S_n = S$ then the series $((a_n), (S_n))$ is **convergent** and its sum is S .

The series which is not convergent is called **divergent**.

$\sum_{n=1}^{\infty} a_k$ is a series. If this series is convergent then,

$\sum_{n=1}^{\infty} a_k = S$. $\sum_{n=1}^{\infty} a \cdot r^{n-1}$ is called a **geometric series**.

If $|r| < 1$ then the series is convergent. The sum of a geometric series is equals the limit of the partial sum sequence of the series.

Let $\sum a \cdot r^n$ be a convergent series. If the first term

$a_p = a \cdot r^p$ and the common difference is r . Then we obtain following equation.

$$\sum_{n=p}^{\infty} a \cdot r^n = \frac{a \cdot r^p}{1-r}$$

1. $\sum_{x=4}^{12} (x-3)^2 = ?$

Yanıt / Answer : 285

2. $\sum_{k=45^\circ}^{315^\circ} \sin k = ?$

Yanıt / Answer : 0

3. $f(x) = x^4 + m,$

$$\sum_{k=1}^n [f(k) - f(k-1)] = 256 \Rightarrow n = ?$$

Yanıt / Answer : 0

4. $\sum_{x=-2}^3 \sum_{y=3}^6 (2y - 3x + 1) = ?$

Yanıt / Answer : 135

5. $\sum_{k=6}^{103} \log \left(1 - \frac{1}{k-3} \right) = ?$

Yanıt / Answer : -2

6. $\ln \left(\prod_{k=10}^{30} e^k \right) = ?$

Yanıt / Answer :

7. $\prod_{n=2}^{255} \log_n (n+1) = ?$

Yanıt / Answer : 8

8. $\sum_{m=0}^7 \prod_{k=1}^9 \left(1 - \frac{1}{k+3} \right) = ?$

Yanıt / Answer : 2