

$$\begin{aligned}
 1. \quad & \lim_{x \rightarrow y+1} \frac{x-y-1}{x^2+y^2-1-2xy} \\
 &= \lim_{x \rightarrow y+1} \frac{x-y-1}{(x-y)^2-1} = \lim_{x \rightarrow y+1} \frac{x-y-1}{(x-y-1)(x-y+1)} \\
 &= \lim_{x \rightarrow y+1} \frac{1}{x-y+1} = \frac{1}{y+1-y+1} = \frac{1}{2}
 \end{aligned}$$

Cevap: D

$$2. \quad \lim_{h \rightarrow 0} \frac{(h+1)(2h+1)}{\left(\frac{h}{h+3}\right)} = \lim_{h \rightarrow 0} \frac{(h+1)(2h+1) \cdot (h+3)}{h} = \frac{3}{0}$$

$= \infty$

Cevap: E

$$3. \quad \lim_{n \rightarrow \infty} (x_n \cdot y_n) = \lim_{n \rightarrow \infty} \sqrt[n]{5} \cdot \left(2 + \frac{1}{n}\right) = 2$$

Cevap: A

$$4. \quad \lim_{x \rightarrow \infty} \frac{5-x^2}{x^2-x-2} = \frac{-1}{1} = -1$$

Cevap: C

$$\begin{aligned}
 5. \quad & \lim_{x \rightarrow k} \frac{x^4 - k^4}{x^2 - k^2} = \lim_{x \rightarrow k} \frac{(x^2 - k^2)(x^2 + k^2)}{x^2 - k^2} \\
 &= \lim_{x \rightarrow k} (x^2 + k^2) = 2k^2
 \end{aligned}$$

Cevap: C

$$\begin{aligned}
 6. \quad & \lim_{x \rightarrow -\infty} (\sqrt{x^2 - 3x} + 5) \\
 & \lim_{x \rightarrow -\infty} \left( \sqrt{1} \left| x - \frac{3}{2} \right| + 5 \right) = \lim_{x \rightarrow -\infty} \left( -x + \frac{3}{2} + 5 \right) \\
 &= \infty
 \end{aligned}$$

Cevap: E

$$\begin{aligned}
 7. \quad & \lim_{x \rightarrow \infty} 2^{x - \sqrt{x^2 + 2x}} = 2^{\lim_{x \rightarrow \infty} (x - \sqrt{x^2 + 2x})} \\
 & 2^{\lim_{x \rightarrow \infty} \left( x - \left| x + \frac{2}{2} \right| \right)} = 2^{\lim_{x \rightarrow \infty} (x - x - 1)} \\
 &= 2^{-1} = \frac{1}{2}
 \end{aligned}$$

Cevap: A

$$8. \quad \lim_{x \rightarrow \infty} \frac{(4x^3 + 3)(5x - 7)}{(5x^4 + 6)(x - 1)} = 0$$

Cevap: B

$$\begin{aligned}
 9. \quad & \lim_{x \rightarrow a} \frac{x^m - a^m}{x^p - a^p} = \lim_{x \rightarrow a} \frac{m \cdot x^{m-1}}{p \cdot x^{p-1}} \\
 &= \frac{m \cdot a^{m-1}}{p \cdot a^{p-1}} = \frac{m}{p} a^{m-1-p+1} \\
 &= \frac{m}{p} \cdot a^{m-p}
 \end{aligned}$$

Cevap: D

$$\begin{aligned}
 10. \quad & \lim_{x \rightarrow 1} \frac{x^2 + 3x - 4}{x^2 + 7x - 8} = \lim_{x \rightarrow 1} \frac{(x-1)(x+4)}{(x-1)(x+8)} \\
 &= \lim_{x \rightarrow 1} \frac{x+4}{x+8} = \frac{5}{9}
 \end{aligned}$$

Cevap: A

$$\begin{aligned}
 11. \quad & \lim_{x \rightarrow 9} \frac{3 - \sqrt{f(9)}}{3 - \sqrt{x}} = \frac{0}{0} \\
 & \lim_{x \rightarrow 9} \frac{-\frac{f'(9)}{2\sqrt{f(9)}}}{-\frac{1}{2\sqrt{x}}} = \frac{-\frac{1}{2 \cdot \sqrt{9}}}{-\frac{1}{2 \cdot \sqrt{9}}} = \frac{-\frac{1}{6}}{-\frac{1}{6}} \\
 &= 1
 \end{aligned}$$

Cevap: D

$$12. \lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x^3 - 27} = \lim_{x \rightarrow 3} \frac{\frac{3-x}{3x}}{(x-3)(x^2+3x+9)}$$

$$\lim_{x \rightarrow 3} \frac{-(x-3)}{3x} \cdot \frac{1}{(x-3)(x^2+3x+9)} = \frac{-1}{3 \cdot 3 \cdot (3^2+3 \cdot 3+9)} = \frac{-1}{243}$$

Cevap: E

$$13. \lim_{n \rightarrow \infty} \frac{3 \frac{n(n+1)}{2} + n}{5n^2 + n + 2} \lim_{n \rightarrow \infty} \frac{3n(n+1) + 2n}{5n^2 + n + 2} \cdot \frac{1}{2}$$

$$\lim_{n \rightarrow \infty} \frac{3n^2 + 3n + 2n}{10n^2 + 2n + 4} = \frac{3}{10}$$

Cevap: E

$$14. \lim_{x \rightarrow 0} \frac{3^{2x+3} - 27}{3^{x+1} - 3} = \lim_{x \rightarrow 0} \frac{3^3(3^{2x} - 1)}{3(3^x - 1)}$$

$$\lim_{x \rightarrow 0} \frac{3^2 \cdot (3^x - 1)(3^x + 1)}{3^x - 1} = \lim_{x \rightarrow 0} 9 \cdot (3^x + 1) = 18$$

Cevap: D

$$15. \lim_{x \rightarrow 0^+} \sqrt[x]{1-2x} = \lim_{x \rightarrow 0^+} (1-2x)^{\frac{1}{x}} = e^{\lim_{x \rightarrow 0^+} \frac{-2x}{x}} = e^{-2}$$

Cevap: A

$$16. \lim_{h \rightarrow 0} \frac{f(2-5h) - f(2+3h)}{h}$$

$$\lim_{h \rightarrow 0} \frac{-5 \cdot f'(2-5h) - 3f'(2+3h)}{1}$$

$$-5f'(2) - 3f'(2) = -8f'(2) \text{ olur.}$$

$$f(x) = (x^2 - 3)^{10} \text{ ise } f'(x) = 10(x^2 - 3)^9 \cdot 2x \text{ olur.}$$

$$-8 \cdot f'(2) = -8 \cdot (10(2^2 - 3)^9 \cdot 2 \cdot 2)$$

$$= -8 \cdot 10 \cdot 4 = -320$$

Cevap: C

$$17. \lim_{x \rightarrow 3} f(x) = 4 \Rightarrow f(3) = 4$$

$$\lim_{x \rightarrow 3} \frac{(f(x) - 3)(f^2(x) - 4 \cdot f(x) + 1)}{x + 3}$$

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

$$\frac{(4 - 3)(4^2 - 4 \cdot 4 + 1)}{6} = \frac{1}{6}$$

Cevap: B

$$18. \lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^+} (4x + 1) = 4 \cdot 1 + 1 = 5$$

$$\lim_{x \rightarrow 4^-} f(x) = \lim_{x \rightarrow 4^-} (4x + 1) = 4 \cdot 4 + 1 = 17$$

$$5 + 17 = 22$$

Cevap: A

$$19. \lim_{x \rightarrow 0^+} \left( \left( \frac{7}{2} \right)^x + \left( \frac{9}{10} \right)^{\frac{1}{x}} + 2 \right)$$

$$\left( \frac{7}{2} \right)^0 + \left( \frac{9}{10} \right)^{\frac{1}{0}} + 2 = 1 + \left( \frac{9}{10} \right)^{\infty} + 2$$

$$= 1 + 0 + 2 = 3$$

Cevap: C

20.  $\lim_{x \rightarrow 4} \frac{f(4x) - f(16)}{x - 4} = \frac{0}{0}$  "L'hopital"

$$= \lim_{x \rightarrow 4} \frac{4 \cdot f'(4x)}{1} = 4 \cdot f'(4 \cdot 4)$$

$$= 4 \cdot f'(16)$$

$$f(x) = 2\sqrt{x} + (x - 15)^{10}$$

$$f'(x) = \frac{2}{2\sqrt{x}} + 10(x - 15)^9$$

$$f'(16) = \frac{2 \cdot 1}{2 \cdot \sqrt{16}} + 10(16 - 15)^9$$

$$= \frac{1}{4} + 10 = \frac{41}{4}$$

$$4 \cdot f'(16) = 4 \cdot \frac{41}{4} = 41 \text{ olur.}$$

Cevap: B