

الف) $y = \frac{x+3}{x^3-20x^2+31x-15} \rightarrow (x-1)(2x-3)(2x-5) \neq 0 \Rightarrow x \neq 1, \frac{3}{2}, \frac{5}{2}$
 $D_f = \mathbb{R} - \{1, \frac{3}{2}, \frac{5}{2}\}$

ب) $y = \frac{x+3}{3x^3-x^2-11x-4} \rightarrow (x+1)(3x^2-4x-4) \neq 0 \Rightarrow x \neq -1, 2, -\frac{2}{3}$
 $D_f = \mathbb{R} - \{-1, 2, -\frac{2}{3}\}$ ۲

الف) $y = \frac{x+1}{x-\sqrt{3-2x}} \rightarrow 3-2x \geq 0 \Rightarrow 3 \geq 2x \Rightarrow \frac{3}{2} \geq x \rightarrow D_f = (-\infty, \frac{3}{2}] - \{1\}$
 $x - \sqrt{3-2x} \neq 0 \Rightarrow x \neq \sqrt{3-2x} \Rightarrow x^2 \neq 3-2x \Rightarrow x^2+2x-3 \neq 0 \Rightarrow (x+3)(x-1) \neq 0 \Rightarrow x \neq -3, 1$

ب) $y = \frac{x+2}{x-\sqrt{3x-2}} \rightarrow x - \sqrt{3x-2} \neq 0 \Rightarrow x^2 \neq 3x-2 \Rightarrow x^2-3x+2 \neq 0 \Rightarrow (x-1)(x-2) \neq 0 \Rightarrow x \neq 1, 2$
 $3x-2 \geq 0 \Rightarrow 3x \geq 2 \Rightarrow x \geq \frac{2}{3}$
 $D_f = [\frac{2}{3}, +\infty) - \{1, 2\}$ ۲

الف) $y = \frac{\sin x}{2\cos x - 1} \rightarrow 2\cos x \neq 1 \Rightarrow \cos x \neq \frac{1}{2} \rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{\pi}{3}, 2k\pi + \frac{5\pi}{3}\}$

ب) $y = \frac{\cos x + 1}{2\sin x + 1} \rightarrow 2\sin x \neq -1 \Rightarrow \sin x \neq -\frac{1}{2} \rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{7\pi}{6}, 2k\pi + \frac{11\pi}{6}\}$

ج) $y = \frac{\tan x + 2}{\cot x - 1} \rightarrow \tan x \neq \text{تعریف نشده}, \cot x \neq 1 \rightarrow D_f = \mathbb{R} - \{\frac{k\pi}{2}, k\pi + \frac{\pi}{4}\}$

د) $y = \frac{\sin x + 1}{k\sin x - 3} \rightarrow k\sin x \neq 3 \Rightarrow \sin x \neq \frac{3}{k} \Rightarrow \sin x \neq \pm \frac{\sqrt{3}}{2} \rightarrow D_f = \mathbb{R} - \{k\pi \pm \frac{\pi}{3}\}$

الف) $x^2-5x+4 > 0 \rightarrow (x-2)(x-4) > 0$
 $D_f = (-\infty, 2) \cup (4, +\infty)$
 ب) $x^2-4x+5 < 0 \rightarrow (x-1)(x-5) < 0$
 $D_f = (1, 5)$
 ج) $x^2+4x+5 \geq 0 \rightarrow (x+1)(x+5) \geq 0$
 $D_f = (-\infty, -5] \cup [-1, +\infty)$
 د) $x^2-7x+9 \leq 0 \rightarrow (x-1)(x-9) \leq 0$
 $D_f = [1, 9]$

الف) $\frac{(x^2-3x+2)(x-1)(x-2)}{x-5} < 0$
 $D_f = (-\infty, 1) \cup (2, 5)$

ب) $\frac{(x^2-1)(x-1)(x+1)}{x^2-4x+5} \geq 0$
 $D_f = (-\infty, -1] \cup (5, +\infty)$

الف) $y = \sqrt{\frac{x^3 - 4x + 3}{x^3 - 1}} \rightarrow (x-1)(x-3)$ $\frac{1}{-} \frac{3}{+}$ $D_f = [3, +\infty)$

ب) $y = \sqrt[3]{\frac{x^3 - 4x + 3}{x^3 - 1}} \rightarrow x^3 \neq 1 \Rightarrow x \neq \pm 1$ $D_f = \mathbb{R} - \{\pm 1\}$

الف) $y = \log(x^3 - 3x)$ $x^3 - 3x > 0 \Rightarrow x(x-3) > 0$ $\frac{0}{+} \frac{3}{-}$ $D_f = (-\infty, 0) \cup (3, +\infty)$

ب) $y = \log \frac{14-x^2}{|x|-2}$ $14-x^2 > 0 \Rightarrow 14 > x^2 \Rightarrow -4 < x < 4$ $|x|-2 \neq 0 \Rightarrow x \neq \pm 2$ $|x|-2 > 0 \Rightarrow |x| > 2 \Rightarrow x > 2 \text{ or } x < -2$ $D_f = (-4, -2) \cup (-2, 2) \cup (2, 4)$

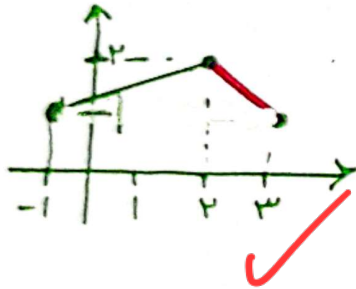
ج) $y = \log \frac{(x^2 - 4x + 12)(x-4)(x-3)}{10-x}$ $\frac{10}{-} \frac{4}{+}$ $10-x > 0 \Rightarrow 10 > x$ $10-x \neq 0 \Rightarrow x \neq 10$ $D_f = (4, 10) - \{9\}$

د) $y = \sqrt{x^2 - 11x + 28} + \log \sqrt{34-x^2}$ $\sqrt{34-x^2} > 0 \Rightarrow 34-x^2 > 0$ $x \rightarrow x \neq 1 \Rightarrow 34 > x^2 \Rightarrow -6 < x < 6$ $x > 0$ $D_f = (0, 6] - \{1\}$

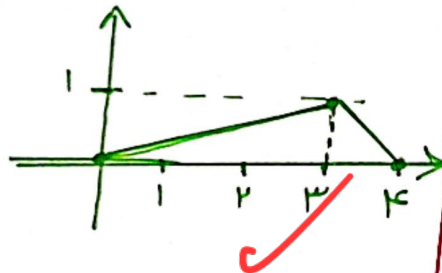
$y = \frac{x^2 - x}{x^2 + x}$ $\frac{x(x-1)}{x(x+1)}$ $\frac{1}{+} \frac{0}{-} \frac{1}{+}$ $\frac{1}{+} \frac{0}{-} \frac{1}{+}$ $\frac{1}{+} \frac{0}{-} \frac{1}{+}$

$y = \sqrt{\frac{x-f(x)}{f(x)}}$ $\frac{-1}{-} \frac{3}{+}$ $D_f = [-2, -1] \cup [2, 3]$

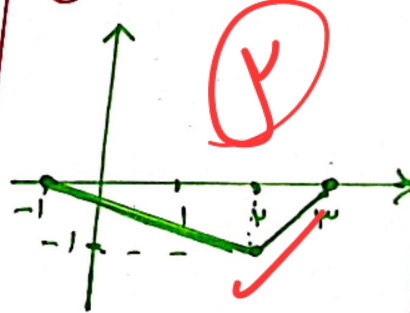
الف) $f(x) + 1$



ب) $f(x-1)$



ج) $-f(x)$



د) $f(x+1) + 2$

