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الف) $\frac{x+5}{5x^3-10x^2+31x-15} = \frac{(x+5)}{(5x-1)(2x-1)(x-1)} \rightarrow \neq 0 \rightarrow D_f = \mathbb{R} - \{0, \frac{1}{5}, \frac{1}{2}, 1\}$

ب) $\frac{x+3}{x^3-x^2-18x-5} = \frac{(x+3)}{(x^2-18)(x+5)} \rightarrow \neq 0 \rightarrow D_f = \mathbb{R} - \{-5\}$

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

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

الف) $y = \frac{\sin x}{2\cos x - 1} \rightarrow 2\cos x - 1 \neq 0 \rightarrow \cos x \neq \frac{1}{2} \rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{\pi}{3}, 2k\pi + \frac{5\pi}{3}\}$

ب) $y = \frac{\cos x + 1}{2\sin x + 1} \rightarrow 2\sin x + 1 \neq 0 \rightarrow \sin x \neq -\frac{1}{2} \rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{7\pi}{6}, 2k\pi + \frac{11\pi}{6}\}$

ج) $y = \frac{\tan x + 2}{\cot x - 1} \rightarrow \begin{cases} \cot x \neq 1 \rightarrow x \neq k\pi + \frac{\pi}{4} \\ \sin x \neq 0 \rightarrow x \neq k\pi \end{cases} \rightarrow D_f = \mathbb{R} - \{k\pi, k\pi + \frac{\pi}{4}\}$

د) $y = \frac{\sin x + 1}{5\sin^2 x - 3} \rightarrow 5\sin^2 x - 3 \neq 0 \rightarrow \sin^2 x \neq \frac{3}{5} \rightarrow \sin x \neq \pm \sqrt{\frac{3}{5}} \rightarrow D_f = \mathbb{R} - \{k\pi \pm \arcsin(\sqrt{\frac{3}{5}})\}$

الف) $x^2-5x+6 > 0 \rightarrow (x-2)(x-3) > 0 \rightarrow \frac{1}{x-2} > \frac{1}{x-3} \rightarrow D_f = (-\infty, 2) \cup (3, +\infty)$

ب) $x^2-4x+5 < 0 \rightarrow (x-1)(x-5) < 0 \rightarrow \frac{1}{x-1} < \frac{1}{x-5} \rightarrow D_f = (1, 5)$

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

د) $x^2-7x+6 \leq 0 \rightarrow (x-6)(x-1) \leq 0 \rightarrow \frac{1}{x-6} \leq \frac{1}{x-1} \rightarrow D_f = [1, 6]$

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

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

$$a) y = \sqrt{\frac{x^2 - 5x + 3}{x^2 - 1}} \rightarrow \frac{(x-3)(x-1)}{(x-1)(x^2+1)} \geq 0 \rightarrow \frac{1}{-} - \frac{3}{+} \rightarrow D_f = [3, +\infty)$$

$$b) \sqrt{\frac{x^2 - 5x + 3}{x^2 - 1}} \rightarrow x^2 - 1 \neq 0 \rightarrow x^2 \neq 1 \rightarrow x \neq \pm 1 \rightarrow D_f = \mathbb{R} - \{\pm 1\}$$

$$a) y = \log(x^2 - 3x) \rightarrow x^2 - 3x > 0 \rightarrow x(x-3) > 0 \rightarrow \frac{0}{+} - \frac{3}{+} \rightarrow D_f = (-\infty, 0) \cup (3, +\infty)$$

$$b) y = \log \frac{14 - x^2}{|x| - 2} \begin{cases} 14 - x^2 > 0 \rightarrow 14 > x^2 \rightarrow -\sqrt{14} < x < \sqrt{14} \\ |x| - 2 > 0 \rightarrow |x| > 2 \rightarrow x > 2, x < -2 \\ |x| - 2 \neq 0 \rightarrow x \neq \pm 2 \end{cases} \rightarrow D_f = (-\sqrt{14}, -2) \cup (2, \sqrt{14}) - \{\pm 2\}$$

$$2) y = \log \frac{x^2 - 7x + 12}{10 - x} \begin{cases} \frac{x^2 - 7x + 12}{10 - x} > 0 \rightarrow \frac{(x-3)(x-4)}{10-x} > 0 \rightarrow \frac{3}{-} - \frac{4}{+} \rightarrow (-\infty, 3) \cup (4, 10) \\ 10 - x > 0 \rightarrow x < 10 \\ 10 - x \neq 0 \rightarrow x \neq 10 \end{cases} \rightarrow D_f = (-\infty, 3) \cup (4, 10) - \{10\}$$

$$3) y = \sqrt{x^2 - 11x + 28} + \log_x \frac{14 - x^2}{|x| - 2} \begin{cases} x^2 - 11x + 28 \geq 0 \rightarrow (x-4)(x-7) \geq 0 \rightarrow x \leq 4, x \geq 7 \\ 14 - x^2 > 0 \rightarrow -\sqrt{14} < x < \sqrt{14} \\ x > 0, x \neq 1 \end{cases} \rightarrow D_f = (0, 4] \cup [7, +\infty) - \{1\}$$

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

روش سریع:

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

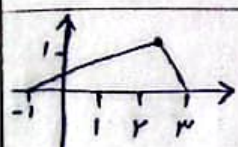
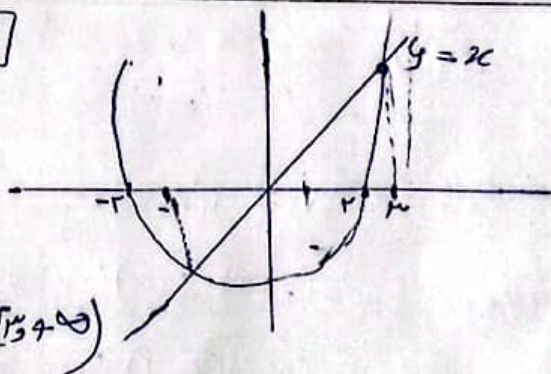
x	-1	0	1
$x^2 - x$	+	+	-
$x^2 + x$	+	-	+
	+	-	+

روش آمار ریاضی:

$$y = \sqrt{\frac{x - F(x)}{F(x)}} \begin{cases} F(x) \neq 0 \rightarrow F(x) = 0 \rightarrow x = [-1, 2] \\ \frac{x - F(x)}{F(x)} \geq 0 \rightarrow x - F(x) \geq 0 \rightarrow x \geq F(x) \end{cases}$$

$$x = F(x) \rightarrow x = [-1, 2]$$

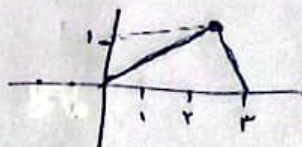
$$\frac{-}{+} \frac{1}{-} \frac{2}{+} \rightarrow D_f = (-\infty, -1) \cup [-1, 2] \cup [2, +\infty)$$



$$a) f(x) + 1 \Rightarrow$$



$$b) f(x-1) \Rightarrow$$



$$c) -f(x) \Rightarrow$$



$$d) f(x+1) + 1 \Rightarrow$$

