

الف) $y = \frac{x+4}{4x^3 - 10x^2 + 31x - 15} \Rightarrow 4x^3 - 10x^2 + 31x - 15 \neq 0$
 $\Rightarrow \frac{x+4}{(x-1)(4x^2 - 14x + 15)} \Rightarrow D_f = \mathbb{R} - \{1, 1.5, 2.5\}$
 $\frac{x-1}{4x^2 - 14x + 15} \Rightarrow \frac{x-1}{(x-1)(x-2)} \Rightarrow \frac{1}{x-2}$
 $1.5 = \frac{1}{2} \quad \frac{2}{3} = 1.5$

ب) $y = \frac{x+3}{3x^3 - x^2 - 8x - 4} \Rightarrow 3x^3 - x^2 - 8x - 4 \neq 0$
 $\Rightarrow \frac{x+3}{(x+1)(3x^2 - 4x - 4)} \Rightarrow D_f = \mathbb{R} - \{-1, -\frac{4}{3}, \frac{4}{3}\}$
 $\frac{x+1}{3x^2 - 4x - 4} \Rightarrow \frac{x+1}{(x-2)(x+2)}$
 $1.2 = \frac{2}{5} \quad 1 - \frac{2}{5} = \frac{3}{5}$

الف) $y = \frac{x+1}{x - \sqrt{3-2x}} \Rightarrow 3-2x \geq 0 \Rightarrow 3 \geq 2x \Rightarrow x \leq \frac{3}{2}$
 $x - \sqrt{3-2x} \neq 0 \Rightarrow x \neq \sqrt{3-2x} \Rightarrow x^2 \neq 3-2x$
 $\Rightarrow x^2 + 2x - 3 \neq 0 \Rightarrow (x+3)(x-1) \neq 0$
 $D_f = (-\infty, 1) \cup (1, 1.5]$

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

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

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

ج) $y = \frac{\tan x + 1}{\cot x - 1} \Rightarrow \cos x \neq 0, \sin x \neq 0, \cot x - 1 \neq 0 \Rightarrow \cot x \neq 1$
 $D_f = \mathbb{R} - \{\frac{k\pi}{4}, k\pi + \frac{\pi}{4}\}$

د) $y = \frac{\sin x + 1}{2\sin^2 x - 3} \Rightarrow 2\sin^2 x - 3 \neq 0 \Rightarrow 2\sin^2 x \neq 3 \Rightarrow \sin^2 x \neq \frac{3}{2} \Rightarrow \sin x \neq \pm \frac{\sqrt{6}}{2}$
 $D_f = \mathbb{R} - \{k\pi \pm \frac{\pi}{4}\}$

الف) $x^2 - 2x + 2 > 0 \Rightarrow (x-1)(x-1) > 0$
 $\frac{1}{+} \frac{1}{-} \frac{2}{+} \quad D_f = (-\infty, 1) \cup (1, +\infty)$

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

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

د) $x^2 - 4x + 4 \leq 0 \Rightarrow (x-1)(x-4) \leq 0$
 $\frac{1}{+} \frac{4}{-} \frac{+}{+} \quad D_f = [1, 4]$

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

ب) $\frac{x^2 - 1}{x^2 - 9x + 5} \geq 0 \Rightarrow \frac{x^2 - 1}{(x-1)(x-5)} \geq 0 \Rightarrow \frac{1}{+} \frac{1}{-} \frac{5}{-}$

$D_f = (-\infty, -1] \cup (5, +\infty)$

الف) $y = \sqrt{\frac{x^2 - 7x + 12}{x^2 - 1}} \Rightarrow \frac{(x-1)(x-3)}{x^2 - 1} \geq 0$ $\frac{-}{+} \frac{+}{-} \frac{+}{+}$
 $D_f = [3, +\infty)$

ب) $y = \sqrt{\frac{x^2 - 7x + 12}{x^2 - 1}} \Rightarrow x^2 - 1 \neq 0 \Rightarrow x^2 \neq 1 \Rightarrow x \neq \pm 1$
 $D_f = \mathbb{R} - \{\pm 1\}$

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

ب) $y = \log \frac{14-x^2}{|x|-2}$ $14-x^2 > 0 \Rightarrow 14 > x^2 \Rightarrow -\sqrt{14} < x < \sqrt{14}$
 $|x|-2 > 0 \Rightarrow |x| > 2$
 $|x|-2 \neq 1 \Rightarrow |x| \neq 3$
 $D_f = (-\sqrt{14}, -2) \cup (-2, -3) \cup (3, 2) \cup (2, \sqrt{14})$

ج) $y = \log \frac{x^2 - 7x + 12}{10-x}$ $\frac{(x-3)(x-4)}{10-x}$ $\frac{+}{-} \frac{+}{-} \frac{+}{+}$
 $10-x > 0 \Rightarrow 10 > x \Rightarrow x < 10$
 $10-x \neq 0 \Rightarrow x \neq 10$
 $D_f = (3, 10) - \{9\}$

د) $y = \sqrt{x^2 - 11x + 18} + \log \sqrt{4-x^2}$ $\sqrt{x^2 - 11x + 18} \geq 0 \Rightarrow (x-2)(x-9) \geq 0$ $\frac{+}{+} \frac{+}{-} \frac{+}{+}$
 $\sqrt{4-x^2} \geq 0 \Rightarrow x^2 \leq 4 \Rightarrow -2 \leq x \leq 2$
 $x \neq 0, x \neq 1$
 $D_f = (0, 2] - \{1\}$

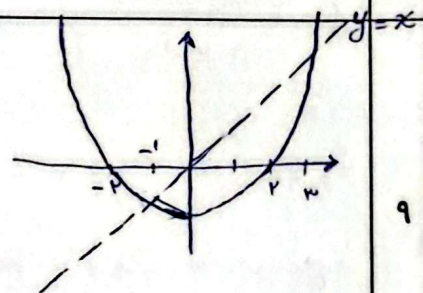
$y = \frac{x^2 - x}{x^2 + x} \Rightarrow \frac{x(x-1)}{x(x+1)} \Rightarrow \frac{-}{+} \frac{+}{-} \frac{+}{+}$ $\frac{-}{+} \frac{+}{-} \frac{+}{+}$

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

درستی آمارهای

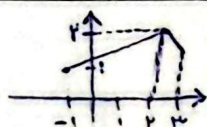
$y = \sqrt{\frac{x-f(x)}{f(x)}}$

	-2	-1	2	3
$x-f(x)$	-	-	+	+
$f(x)$	+	-	-	+
ρ	-	+	-	+

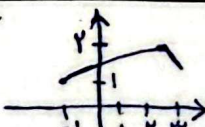


$D_f = (-2, -1] \cup (2, 3)$

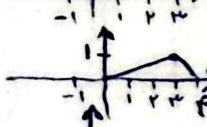
الف) $f(x) + 1$



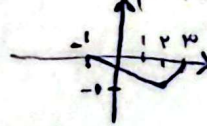
تغییرات



ب) $f(x-1)$



ج) $-f(x)$



د) $f(x+1) + 2$



$f(x)$

