

1- الف: $y = \frac{x+4}{x^2-10x^2+31x-15} = 4 + (-20) + 31 + (-15) = 0$ (الف: $x=0$ من خارج است)
 $3x^2 - 10x^2 + 31x - 15 = (x-1)(3x^2 - 19x + 15)$
 $3x^2 - 19x + 15 = 0 \Rightarrow x = \frac{19 \pm \sqrt{19^2 - 4 \cdot 3 \cdot 15}}{2 \cdot 3} = \frac{19 \pm \sqrt{15}}{6} = \frac{19 \pm \sqrt{15}}{6}$
 دامنه: $\mathbb{R} \setminus \{1, \frac{19+\sqrt{15}}{6}, \frac{19-\sqrt{15}}{6}\}$

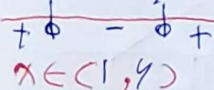
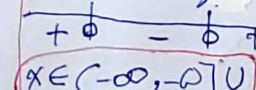
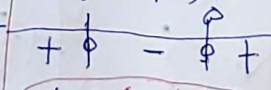
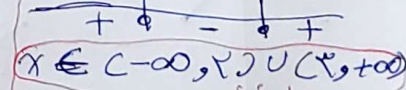
2- الف: $y = \frac{x+3}{3x^2-x^2-11x-4} = 3 + (-1) + (-11) + (-4) = -10 \neq 0$
 $3x^2 - x^2 - 11x - 4 = (x+1)(3x^2 - 4x - 4)$
 $3x^2 - 4x - 4 = 0 \Rightarrow x = \frac{4 \pm \sqrt{16+48}}{6} = \frac{4 \pm \sqrt{64}}{6} = \frac{4 \pm 8}{6}$
 $x = \frac{12}{6} = 2$ or $x = \frac{-4}{6} = -\frac{2}{3}$
 دامنه: $\mathbb{R} \setminus \{-1, 2, -\frac{2}{3}\}$

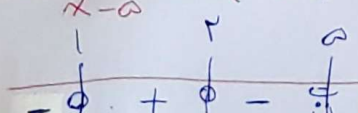
3- الف: $y = \frac{x+1}{x-\sqrt{3-2x}} = 3 - 2x \geq 0 \Rightarrow x \leq \frac{3}{2}$
 $x^2 = 3 - 2x \Rightarrow (x+3)(x-1) = 0 \Rightarrow x = -3$ or $x = 1$
 دامنه: $(-\infty, 1) \cup (1, \frac{3}{2}]$

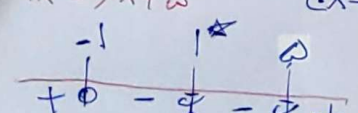
4- الف: $y = \frac{x+2}{x-\sqrt{2x-2}} = 2x - 2 \geq 0 \Rightarrow x \geq \frac{1}{2}$
 $x^2 = 2x - 2 \Rightarrow (x-1)(x-2) = 0 \Rightarrow x = 1$ or $x = 2$
 دامنه: $[\frac{1}{2}, 1) \cup (1, 2) \cup (2, +\infty)$

3- الف: $\cos x = \frac{1}{2} \Rightarrow y = \frac{\sin x}{2\cos x - 1}$
 $2\cos x - 1 = 0 \Rightarrow \cos x = \frac{1}{2} \Rightarrow x = \frac{\pi}{3} + 2k\pi$ or $x = \frac{5\pi}{3} + 2k\pi$
 $\sin x = \frac{\sqrt{3}}{2}$ or $-\frac{\sqrt{3}}{2}$
 دامنه: $\mathbb{R} \setminus \{\frac{\pi}{3} + 2k\pi, \frac{5\pi}{3} + 2k\pi \mid k \in \mathbb{Z}\}$

3- الف: $\sin x = \frac{1}{2} \Rightarrow y = \frac{\cos x + 1}{\sin x - \frac{1}{2}}$
 $\sin x - \frac{1}{2} = 0 \Rightarrow \sin x = \frac{1}{2} \Rightarrow x = \frac{\pi}{6} + 2k\pi$ or $x = \frac{5\pi}{6} + 2k\pi$
 $\cos x = \frac{\sqrt{3}}{2}$ or $-\frac{\sqrt{3}}{2}$
 دامنه: $\mathbb{R} \setminus \{\frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi \mid k \in \mathbb{Z}\}$

$x^2 - 4x + 4 < 0 \Rightarrow (x-2)^2 < 0$ $(x-1)(x-3) > 0 \Rightarrow x < 1$ or $x > 3$ $x = 2$  $x \in (-\infty, 1) \cup (3, +\infty)$	$x^2 + 9x + 5 > 0 \Rightarrow (x+1)(x+5) > 0$ $x = -1$ or $x = -5$  $x \in (-\infty, -5) \cup (-1, +\infty)$	$x^2 - 9x + 10 < 0 \Rightarrow (x-1)(x-10) < 0$ $x = 1$ or $x = 10$  $x \in (1, 10)$	$x^2 - 5x + 5 > 0 \Rightarrow (x-2)(x-3) > 0$ $x = 2$ or $x = 3$  $x \in (-\infty, 2) \cup (3, +\infty)$
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الف: $\frac{x^2-2x+2}{x-2} < 0 \Rightarrow (x-1)(x-2) = \frac{(x-2)(x-1)}{x-2} < 0 \Rightarrow x < 1$ or $x > 2$
 $x = 2$

 $x \in (-\infty, 1) \cup (2, +\infty)$

الف: $\frac{x^2-1}{x^2-9x+5} \geq 0 \Rightarrow \frac{(x-1)(x+1)}{(x-1)(x-5)} = \frac{x+1}{x-5} \geq 0$
 $x = -1$ or $x = 5$

 $x \in (-\infty, -1) \cup (5, +\infty)$

$$y = \sqrt{\frac{x^2 - 5x + 3}{x^2 - 1}} = x - 1 \neq 0 \quad x \neq 1 \quad x \neq -1 \quad \frac{(x-1)(x-3)}{(x-1)(x+1)}$$

$$x \neq 1 \quad \frac{(x-3)}{(x^2 + x + 1)} > 0 \quad x - 3 \geq 0 \quad x \geq 3 \quad 3 \leq x^2 + x + 1$$

$$x \in [3, +\infty)$$

$$y = \sqrt{\frac{x^2 - 5x + 3}{x^2 - 1}} = x - 1 \neq 0 \quad 0 \neq (x+1)(x-1) \quad x \neq -1, x \neq 1$$

$$x^2 - 5x + 3 = (x-1)(x-3) \quad (-\infty, -1) \cup (-1, 1) \cup (1, +\infty)$$

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

$$y = \log \frac{x - \sqrt{x^2 + 1}}{10 - x}$$

$$\frac{x - \sqrt{x^2 + 1}}{x - 3} > 0 \quad x \neq 3$$

$$10 - x > 0 \quad 10 - x \neq 1$$

$$x < 10 \quad x \neq 9$$

$$(-\infty, 9) \cup (9, +\infty)$$

$$y = \log |3 - x^2|$$

$$3 - x^2 > 0 \quad -\sqrt{3} < x < \sqrt{3}$$

$$|x| - 2 > 0 \quad |x| - 2 \neq 1$$

$$|x| \neq 3, |x| > 2$$

$$-\sqrt{3} < x < -2 \quad x < -2$$

$$2 < x < \sqrt{3} \quad x > 2$$

$$(-\sqrt{3}, -2) \cup (2, \sqrt{3})$$

$$y = \log(x^2 - 3x)$$

$$x^2 - 3x > 0 \quad x(x-3) > 0$$

$$x = 0 \text{ or } x = 3$$

$$(-\infty, 0) \cup (3, +\infty)$$

$$y = \sqrt{x^2 - 11x + 18} + \log \sqrt{4 - x^2}$$

$$x^2 - 11x + 18 \geq 0 \quad (x-2)(x-9) \geq 0$$

$$0 < x < 2 \quad 2 < x < 9$$

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

x	(x-1)	(x+1)	$\frac{x-1}{x+1}$
$x < -1$	-	-	-
$-1 < x < 0$	-	+	+
$0 < x < 1$	+	+	-
$x > 1$	+	+	+

$$P(x) = \frac{x-1}{x+1}$$

$$y = \sqrt{\frac{x - f(x)}{f(x)}} = f(x) \neq 0 \quad x \neq 1, x \neq 0 \quad \frac{x - f(x)}{f(x)} > 0 \quad f(x) = 0$$

$$f(1) = -1 \quad x = 1 \quad x < 0 \quad f(x) > 0 \quad x > 1 \quad f(0) = 0$$

$$x - f(x) = \frac{x - f(x)}{f(x)} = \frac{0}{f} = 0 \quad x = 1; \text{ نه}$$

$$x = 1; \text{ نه}$$

