

الف) $y = \frac{x+1}{x^3-2x^2+3x-1} = \frac{x+1}{(x-1)(x^2-4x+1)} = \frac{x+1}{(x-1)(2x-1)(x-5)}$ $\rightarrow$ ریشه ها $\left\{ \frac{1}{2}, 1, 5 \right\}$
 جمع ضرایب = صفر

$D_f = \mathbb{R} - \left\{ 1, \frac{1}{2}, 5 \right\}$

ب) $y = \frac{x+3}{3x^3-x^2-11x-4} = \frac{x+3}{(x+1)(3x^2-4x-4)} = \frac{x+3}{(x+1)(x-2)(3x+2)}$ $\rightarrow$ ریشه ها $\left\{ -\frac{1}{3}, -2, \frac{2}{3} \right\}$
 جمع ضرایب توان فر = جمع ضرایب توان زوج = جمع ضرایب توان فرد

$D_f = \mathbb{R} - \left\{ -1, -\frac{2}{3}, -\frac{2}{3} \right\}$

الف) $y = \frac{x+1}{x-\sqrt{3-2x}}$

$\begin{cases} 3-2x \geq 0 \\ x \leq \frac{3}{2} \end{cases} \quad \begin{cases} x-\sqrt{3-2x} \neq 0 \\ x^2 \neq 3-2x \\ x^2+2x-3 \neq 0 \\ (x-1)(x+3) \neq 0 \end{cases} \quad \begin{cases} x \neq 1 \\ x \neq -3 \end{cases}$

$D_f = \left[\frac{3}{2}, \infty \right) - \{1, -3\}$
 اگر دو معادله اصلی یکدیگر را هم صفری دهی

ب) $y = \frac{x+2}{x-\sqrt{3x-2}}$

$\begin{cases} 3x-2 \geq 0 \\ x \geq \frac{2}{3} \end{cases} \quad \begin{cases} x-\sqrt{3x-2} \neq 0 \\ x^2 \neq 3x-2 \\ x^2-3x+2 \neq 0 \\ (x-1)(x-2) \neq 0 \end{cases} \quad \begin{cases} x \neq 1 \\ x \neq 2 \end{cases}$

$D_f = \left[\frac{2}{3}, \infty \right) - \{1, 2\}$

الف) $y = \frac{\sin x}{2\cos x - 1}$

$\begin{cases} 2\cos x - 1 \neq 0 \\ \cos x \neq \frac{1}{2} \end{cases} \Rightarrow D_f = \mathbb{R} - \{2k\pi \pm \frac{\pi}{3}\}$

ب) $y = \frac{\cos x + 1}{2\sin x + 1}$

$\begin{cases} 2\sin x + 1 \neq 0 \\ \sin x \neq -\frac{1}{2} \end{cases} \Rightarrow D_f = \mathbb{R} - \{2k\pi - \frac{\pi}{6}, 2k\pi - \frac{5\pi}{6}\}$

ج) $y = \frac{\tan x + 2}{\cot x - 1}$

$\begin{cases} \sin x \neq 0 \\ \cos x \neq 0 \end{cases} \quad \begin{cases} \cot x - 1 \neq 0 \\ \cot x \neq 1 \end{cases} \Rightarrow D_f = \mathbb{R} - \left\{ \frac{k\pi}{2}, k\pi + \frac{\pi}{4} \right\}$

د) $y = \frac{\sin x + 1}{2\sin^2 x - 3}$

$\begin{cases} 2\sin^2 x - 3 \neq 0 \\ \sin^2 x \neq \frac{3}{2} \end{cases} \quad \begin{cases} \sin x \neq \pm \frac{\sqrt{3}}{2} \end{cases} \Rightarrow D_f = \mathbb{R} - \left\{ 2k\pi \pm \frac{\pi}{3}, 2k\pi \pm \frac{2\pi}{3} \right\}$

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

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

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

د) $x^2 - 7x + 4 \leq 0 \quad (x-1)(x-4) \leq 0 \quad \frac{1}{x-1} - \frac{1}{x-4} \leq 0 \Rightarrow [1, 4]$

الف) $\frac{x^2 - 3x + 2}{x - 5} < 0$ $\begin{cases} x - 5 \neq 0 \\ x \neq 5 \end{cases}$ $\left\{ \frac{(x-1)(x-2)}{x-5} \right\}$ $\begin{array}{c|ccc} & 1 & 2 & 5 \\ \hline & - & + & - \end{array}$ $\Rightarrow (-\infty, 1) \cup (2, 5)$

ب) $\frac{x-1}{x^2 - 4x + 5} \geq 0$ $\frac{(x-1)(x+1)}{(x-1)(x-5)}$ $\begin{array}{c|ccc} & -1 & 1 & 5 \\ \hline & + & - & - \end{array}$ $\Rightarrow (-\infty, -1] \cup (5, +\infty)$

الف) $y = \sqrt{\frac{x^2 - 3x + 2}{x^2 - 1}} = \frac{(x-1)(x-2)}{(x-1)(x+1+x)}$ $\begin{array}{c|ccc} & 1 & 2 & - \\ \hline & - & + & + \end{array}$ $D_f = [2, +\infty)$

ب) $y = \sqrt{\frac{x^2 - 3x + 2}{x^2 - 1}}$ $\begin{cases} x^2 - 1 \neq 0 \\ (x+1)(x-1) \neq 0 \end{cases}$ $D_f = \mathbb{R} - \{-1, 1\}$

الف) $\log(x^2 - 3x)$ $\begin{cases} x^2 - 3x > 0 \\ x(x-3) > 0 \end{cases}$ $\begin{array}{c|ccc} & 0 & 3 \\ \hline & + & - & + \end{array}$ $D_f = (-\infty, 0) \cup (3, +\infty)$

ب) $y = \log \frac{1-x}{|x|-2}$ $\begin{cases} |x|-2 \neq 0 \\ |x| \neq 2 \\ x \neq \pm 2 \end{cases}$ $\begin{cases} |x|-2 > 0 \\ |x| > 2 \end{cases}$ $\begin{cases} 1-x > 0 \\ (1-x)(1+x) > 0 \end{cases}$ $\begin{array}{c|ccc} & -1 & 1 \\ \hline & - & + & - \end{array}$ $D_f = (-1, -2) \cup (2, 1) - \{2, -2\}$

ج) $\log \frac{x^2 - \sqrt{x} + 2}{1-x}$ $\begin{cases} x^2 - \sqrt{x} + 2 \neq 0 \\ x \neq 1 \end{cases}$ $\begin{cases} 1-x \neq 0 \\ x \neq 1 \end{cases}$ $\begin{cases} 1-x > 0 \\ x < 1 \end{cases}$ $\frac{(x-1)(x-2)}{x-1} > 0$ $\begin{array}{c|ccc} & 1 & 2 \\ \hline & - & + & - \end{array}$ $D_f = (1, 2) - \{1\}$

د) $y = \sqrt{x^2 - 11x + 28} + \log \sqrt{4-x}$ $\begin{cases} x^2 - 11x + 28 \geq 0 \\ (x-4)(x-7) \geq 0 \end{cases}$ $\begin{cases} 4-x \geq 0 \\ x \leq 4 \end{cases}$ $\begin{array}{c|ccc} & 4 & 7 \\ \hline & - & + & - \end{array}$ $\begin{array}{c|ccc} & 4 & 7 \\ \hline & + & - & + \end{array}$ $D_f = [4, 7]$

پ) $y = \frac{x^2 - x}{x^2 + x} = \frac{x(x-1)}{x(x+1)}$ $\begin{array}{c|ccc} & -1 & 0 & 1 \\ \hline & + & - & + \end{array}$

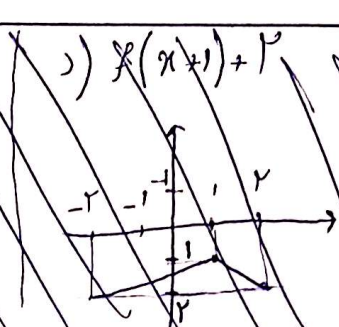
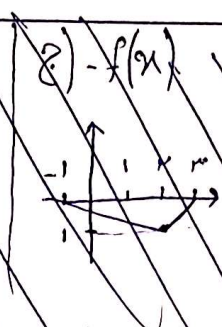
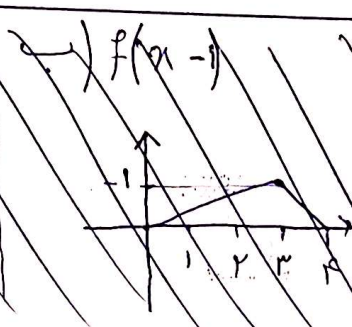
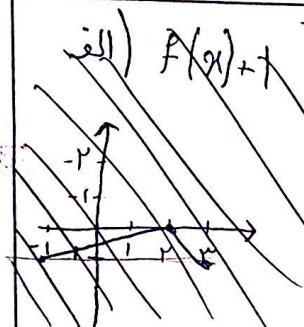
	-1	0	1
$x^2 - x$	+	+	-
$x^2 + x$	+	-	+
$p(x)$	+	-	+

آپاراتی

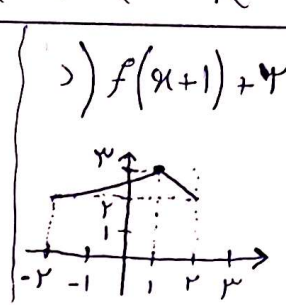
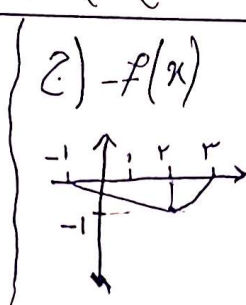
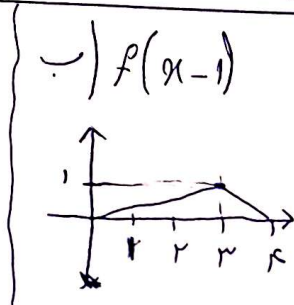
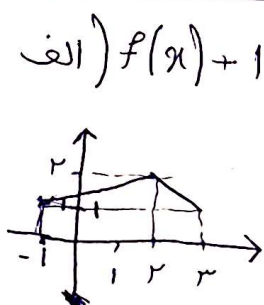
$$p(x) \rightarrow y = \sqrt{\frac{x - f(x)}{f(x)}}$$

	-2	-1	0	1	2
$x - f(x)$	-	-	0	+	+
$f(x)$	+	0	-	0	+
$p(x)$	-	0	+	0	-

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