

الف) $y = \frac{x+4}{x^3 - 20x^2 + 31x - 15}$ $\rightarrow$ جمع فزاینده ب) $y = \frac{x+3}{x^3 - 2x^2 - 11x - 4}$ $D_f = \mathbb{R} - \{1, 4\}$ $D_f = \mathbb{R} - \{-1, -\frac{4}{3}, 2\}$	یکی از ریشه ها ۱ است $x^3 - 20x^2 + 31x - 15 \div (x-1)$ $(x-1)(x^2 - 19x + 16)$ $(x-1)(x-16)(x-1)$ جمع فزاینده توان فرد در مجموع با هم برابر است پس یکی از ریشه ها ۱ است. $x^3 - 2x^2 - 11x - 4 \div (x+1)$ $(x+1)(x^2 - 3x - 4)$ $(x+1)(x-4)(x+1)$	الف) $y = \frac{x+1}{x - \sqrt{3-2x}}$ ب) $y = \frac{x+2}{x - \sqrt{3-2x}}$ $D_f = (-\infty, \frac{3}{4}] - \{-3, 1\}$ $D_f = [\frac{3}{4}, +\infty) - \{1, 2\}$	$\begin{cases} \sqrt{3-2x} \geq 0 \rightarrow 3-2x \geq 0 \rightarrow \frac{3}{2} \leq x \leq \frac{3}{2} \rightarrow x \leq \frac{3}{2} \\ n - \sqrt{3-2n} \neq 0 \rightarrow n \neq \sqrt{3-2n} \rightarrow n^2 \neq 3-2n \end{cases}$ $(n-1)(n+3) \leftarrow n^2 + 2n - 3 \neq 0$ $\begin{cases} \sqrt{3-2x} \geq 0 \rightarrow 3-2x \geq 0 \rightarrow x \geq \frac{3}{2} \rightarrow x \geq \frac{3}{2} \\ n - \sqrt{3-2n} \neq 0 \rightarrow n \neq \sqrt{3-2n} \rightarrow n^2 - 3n + 2 \neq 0 \rightarrow (n-1)(n-2) \end{cases}$	الف) $y = \frac{\sin x}{x \cos x - 1}$ ب) $y = \frac{\cos x + 1}{x \sin x + 1}$ ج) $y = \frac{\tan x + 2}{\cot x - 1}$ د) $y = \frac{\sin x + 1}{x \sin^2 x - 3}$ $x \cos x - 1 \neq 0, \cos x \neq \frac{1}{x}$ $x \sin x + 1 \neq 0, \sin x \neq -\frac{1}{x}$ $\cot x - 1 \neq 0, \cot x \neq 1 \rightarrow \begin{cases} \cot x \neq 1 \\ \sin x \neq 0 \end{cases}$ $x \sin^2 x - 3 \neq 0, \sin^2 x \neq \frac{3}{x}$ $D_f = \mathbb{R} - \{k\pi - \frac{\pi}{4}, k\pi + \frac{\pi}{4}\}$ $D_f = \mathbb{R} - \{k\pi + \pi + \frac{\pi}{4}, k\pi - \frac{\pi}{4}\}$ $D_f = \mathbb{R} - \{k\pi, k\pi + \frac{\pi}{2}\}$ $D_f = \mathbb{R} - \{k\pi + \frac{\pi}{4}, k\pi + \pi - \frac{\pi}{4}\}$	الف) $x^2 - 4x + 4 > 0$ ب) $x^2 - 4x + 4 < 0$ ج) $x^2 + 4x + 4 \geq 0$ د) $x^2 - 4x + 4 \leq 0$ $(x-2)^2 > 0 \rightarrow x \neq 2$ $(x-2)^2 < 0$ (impossible) $(x+2)^2 \geq 0$ (always true) $(x-2)^2 \leq 0 \rightarrow x = 2$ $D_f = (-\infty, 2) \cup (2, +\infty)$ $D_f = (1, 4)$ $D_f = (-\infty, -4] \cup [-1, +\infty)$ $D_f = [1, 4]$	الف) $\frac{x^2 - 4x + 2}{x - 4} \leq 0$ ب) $\frac{x^2 - 1}{x^2 - 4x + 4} \geq 0$ $x - 4 \neq 0 \rightarrow x \neq 4$ $(x-1)(x+1) \geq 0$ $x^2 - 4x + 4 \neq 0 \rightarrow x \neq 2$ $D_f = (-\infty, 1] \cup [2, 4)$ $D_f = (-\infty, -1] \cup (4, +\infty)$
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الف) $y = \sqrt{\frac{x^2 - 5x + 3}{x^2 - 1}}$

$\frac{x^2 - 5x + 3}{x^2 - 1} \geq 0$ $\rightarrow$ ① $\rightarrow$ ③

$\rightarrow x^2 - 1 \neq 0, x^2 \neq -1 \rightarrow x \neq \pm 1$

$D_f = [3, +\infty)$

ب) $y = \sqrt[3]{\frac{x^2 - 5x + 3}{x^2 - 1}}$

$\rightarrow x^2 - 1 \neq 0, x^2 \neq -1 \Rightarrow x \neq \pm 1$

$D_f = \mathbb{R} - \{\pm 1\}$

الف) $y = \log(x^2 - 3x)$ $x^2 - 3x > 0$

$x(x-3) > 0$ $D_f = (-\infty, 0) \cup (3, +\infty)$

ب) $y = \log |4 - x^2|$

$|4 - x^2| > 0$ $\rightarrow x \neq \pm 2$ $D_f = (-2, 2)$

ج) $y = \log \frac{x^2 - 5x + 3}{x - 2}$

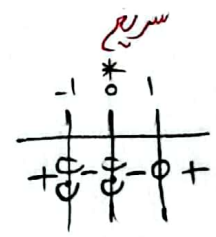
$\frac{x^2 - 5x + 3}{x - 2} > 0$ $\rightarrow x < 1$ or $x > 3$ $D_f = (-\infty, 1) \cup (3, +\infty) - \{2\}$

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

$\begin{cases} x^2 - 11x + 18 \geq 0 \\ x > 0, x \neq 1 \end{cases}$ $D_f = (0, 2) \cup (3, +\infty) - \{1\}$

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

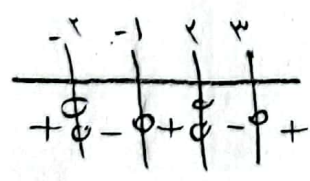
$x^2 - x$	-	-	0	-	+
$x^2 + x$	-	0	+	+	+
$D(x)$	+	+	-	-	+



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

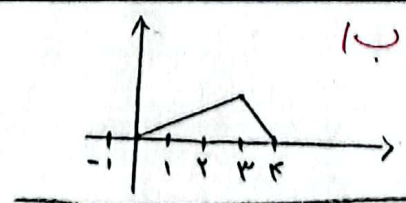
$\frac{x - f(x)}{f(x)} \geq 0, f(x) \neq 0$

$\begin{cases} x = f(x) = [2, 3] \\ f(x) \neq 0 \Rightarrow f(x) \neq -5, 2 \end{cases}$

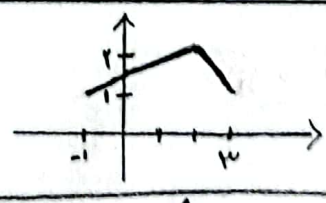


$D_f = (-\infty, -2) \cup (-1, 2) \cup (3, +\infty)$

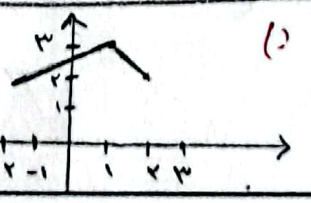
الف) $f(x) + 1$



ب) $f(x-1)$



ج) $-f(x)$



د) $f(x+1) + 2$

