

الف) $4x^3 - 12x^2 + 9x - 1 \neq 0 \Rightarrow (x-1)(4x^2 - 8x + 1) \neq 0 \Rightarrow$
 $(x-1)(2x-5)(2x-1) \neq 0 \Rightarrow D_f = \mathbb{R} - \{1, \frac{5}{2}, \frac{1}{2}\}$

ب) $3x^3 - x^2 - 18x - 4 \neq 0 \Rightarrow (x+1)(3x^2 - 4x - 4) \neq 0 \Rightarrow$
 $x+1 \neq 0 \Rightarrow x \neq -1$
 $\frac{3x^2 - 4x - 4}{x} \neq 0 \xrightarrow{\text{ریشه‌ها}} x^2 - 4x - 12 \neq 0 \Rightarrow (x-6)(x+2) \Rightarrow \begin{cases} x \neq \frac{6}{3} = 2 \\ x \neq -\frac{2}{3} \end{cases}$
 $\Rightarrow D_f = \mathbb{R} - \{-1, -\frac{2}{3}, 2\}$

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

ب) $3x-2 \geq 0 \Rightarrow 3x \geq 2 \Rightarrow x \geq \frac{2}{3}$
 $x - \sqrt{3x-2} \neq 0 \Rightarrow x \neq \sqrt{3x-2} \Rightarrow x^2 \neq 3x-2 \Rightarrow x^2 - 3x + 2 \neq 0 \Rightarrow (x-1)(x-2) \neq 0$

الف) $2 \cos x - 1 \neq 0 \Rightarrow 2 \cos x \neq 1 \Rightarrow \cos x \neq \frac{1}{2} \Rightarrow D_f = [\frac{\pi}{3}, +\infty) - \{1, 2\}$

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

ج) $\cot x - 1 \neq 0 \Rightarrow \cot x \neq 1$
 $\tan x = \frac{\sin x}{\cos x}, \cot x = \frac{\cos x}{\sin x} \Rightarrow \sin x \neq 0, \cos x \neq 0 \Rightarrow D_f = \mathbb{R} - \{k\pi, k\pi + \frac{\pi}{2}\}$

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

الف) $x^2 - 5x + 4 = 0 \Rightarrow (x-1)(x-4) = 0 \Rightarrow \begin{matrix} x=1 \\ x=4 \end{matrix} \Rightarrow D_f = (-\infty, 1) \cup (4, +\infty)$

ب) $x^2 - 4x + 4 = 0 \xrightarrow{\text{مربع کامل}} (x-2)^2 = 0 \Rightarrow x=1, x=5 \Rightarrow D_f = (1, 5)$

ج) $x^2 + 4x + 4 = 0 \xrightarrow{a+b+c} (x+2)^2 = 0 \Rightarrow x=-1, x=-5 \Rightarrow D_f = (-\infty, -5] \cup [-1, +\infty)$

د) $x^2 - 7x + 4 = 0 \xrightarrow{a+b+c} x=1, x=6 \Rightarrow D_f = [1, 6]$

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

ب) $\begin{cases} x^2 - 1 = 0 \Rightarrow (x+1)(x-1) = 0 \Rightarrow x=1, x=-1 \\ x^2 - 7x + 4 = 0 \Rightarrow x=1, x=6 \end{cases} \Rightarrow D_f = (-\infty, -1] \cup (6, +\infty)$

الف) $\frac{x^2 - 4x + 3}{x - 1} \geq 0 \Rightarrow \begin{cases} x^2 - 4x + 3 = 0 \Rightarrow x = 1, x = 3 \\ x^2 - 1 = 0 \Rightarrow x = 1 \end{cases}$ $\begin{array}{c|ccc} x & 1 & 3 & \\ \hline & - & + & + \end{array} \Rightarrow D_f = [3, +\infty)$

ب) $x^2 - 1 \neq 0 \Rightarrow x \neq 1, x \neq -1 \Rightarrow D_f = \mathbb{R} - \{\pm 1\}$

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

ب) $\begin{cases} 14 - x^2 > 0 \Rightarrow x^2 < 14 \Rightarrow -\sqrt{14} < x < \sqrt{14} \quad \text{I} \\ |x| - 2 > 0 \Rightarrow |x| > 2 \Rightarrow \begin{cases} x > 2 \\ x < -2 \end{cases} \quad \text{II} \\ |x| - 2 \neq 1 \Rightarrow |x| \neq 3 \Rightarrow x \neq \pm 3 \quad \text{III} \end{cases}$ $\text{I} \cap \text{II} \cap \text{III} \Rightarrow D_f = (-\sqrt{14}, -2) \cup (-2, -3) \cup (2, 3) \cup (3, \sqrt{14})$

ج) $\frac{x^2 - 5x + 4}{x - 3} > 0 \Rightarrow \frac{(x - 1)(x - 4)}{x - 3} > 0 \Rightarrow \begin{array}{c|ccc} x & 1 & 3 & 4 & \\ \hline & + & - & + & + \end{array} \quad \text{I}$

$\begin{cases} 1 - x > 0 \Rightarrow x < 1 \quad \text{II} \\ 1 - x \neq 1 \Rightarrow x \neq 0 \quad \text{III} \end{cases} \Rightarrow \text{II} \cap \text{III} \cap \text{I} \Rightarrow D_f = (0, 1) - \{0\}$

د) $x^2 - 11x + 28 \geq 0 \Rightarrow (x - 4)(x - 7) \geq 0 \Rightarrow \begin{array}{c|ccc} x & 4 & 7 & \\ \hline & + & - & + \end{array} \quad \text{I}$

$\sqrt{34 - x^2} > 0 \Rightarrow 34 - x^2 > 0 \Rightarrow x^2 < 34 \Rightarrow -\sqrt{34} < x < \sqrt{34} \quad \text{II}$

$x > 0 \quad \text{III}$

$x \neq 1 \quad \text{IV}$

$\text{I} \cap \text{II} \cap \text{III} \cap \text{IV} \Rightarrow D_f = (0, \sqrt{34}) - \{1\}$

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

روشنی آید:

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

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

$\begin{array}{c|ccc} x & -2 & -1 & 2 & 3 & \\ \hline & - & + & - & + & \end{array}$

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

