

الف) $y = \frac{x+3}{x^3-2x^2+3x-10}$ → جمع ضرایب صفر → $x^3-2x^2+3x-10 \mid x-1$
 $\Rightarrow (x-1)(x^2-1x+10) \neq 0 \Rightarrow (x-1)(x^2-2x-3)(x-5) \neq 0$
 $\Rightarrow (x-1)(x-3)(x+2)(x-5) \neq 0$
 $\Rightarrow x \neq 1, 3, -2, 5$
 $D_f = \mathbb{R} - \{1, 3, -2, 5\}$

ب) $y = \frac{x+3}{x^3-2x^2+3x-10}$ → $x^3-2x^2+3x-10 \mid x+1$
 $\Rightarrow (x+1)(x^2-3x-10) \neq 0 \Rightarrow (x+1)(x-5)(x+2) \neq 0$
 $\Rightarrow x \neq -1, 5, -2$
 $D_f = \mathbb{R} - \{-1, 5, -2\}$
 $\Rightarrow x-2 \geq 0 \Rightarrow x \geq 2 \Rightarrow \frac{x}{3} \geq \frac{2}{3}$
 $\Rightarrow x \neq \sqrt{3-2x} \Rightarrow x^2 \neq 3-2x \Rightarrow x^2-2x+3 \neq 0$
 $\Rightarrow (x-1)(x-2) \neq 0 \Rightarrow x \neq 1, 2$
 $D_f = [\frac{2}{3}, +\infty) - \{1, 2\}$

الف) $y = \frac{\sin x}{x \cos x - 1}$ → $x \cos x - 1 \neq 0 \Rightarrow x \cos x \neq 1 \Rightarrow \cos x \neq \frac{1}{x} \Rightarrow x \neq \frac{\pi}{3}, \frac{5\pi}{3}, \dots$
 $\Rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{\pi}{3}, 2k\pi + \frac{5\pi}{3}\}$
 $\Rightarrow x \sin x + 1 \neq 0 \Rightarrow x \sin x \neq -1 \Rightarrow \sin x \neq -\frac{1}{x} \Rightarrow x \neq \frac{\sqrt{\pi}}{4}, \frac{11\pi}{4}, \dots$
 $\Rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{\sqrt{\pi}}{4}, 2k\pi + \frac{11\pi}{4}\}$
 $\Rightarrow \cos x \neq 0 \Rightarrow x \neq \frac{\pi}{2}, \frac{3\pi}{2}, \dots$
 $\Rightarrow \sin x \neq 0 \Rightarrow x \neq k\pi, \dots$
 $\Rightarrow \cot x - 1 \neq 0 \Rightarrow \cot x \neq 1 \Rightarrow x \neq \frac{\pi}{4}, \frac{5\pi}{4}, \dots$
 $\Rightarrow D_f = \mathbb{R} - \{k\pi \pm \frac{\pi}{4}\}$

الف) $x^2-5x+4 > 0 \Rightarrow (x-2)(x-3) > 0 \Rightarrow x = (-\infty, 2) \cup (3, +\infty)$
 ب) $x^2-4x+0 < 0 \Rightarrow (x-1)(x-5) < 0 \Rightarrow x = (1, 5)$
 ج) $x^2+4x+0 \geq 0 \Rightarrow (x+1)(x+0) \geq 0 \Rightarrow x = (-\infty, -1] \cup [0, +\infty)$
 د) $x^2-4x+4 \leq 0 \Rightarrow (x-1)(x-4) \leq 0 \Rightarrow x = [1, 4]$

الف) $\frac{x^2-3x+2}{x-0} < 0 \Rightarrow \frac{(x-1)(x-2)}{x-0} < 0 \Rightarrow x = (-\infty, 1) \cup (2, 0)$
 ب) $\frac{x^2-1}{x^2-4x+0} \geq 0 \Rightarrow \frac{(x+1)(x-1)}{(x-1)(x-0)} \geq 0 \Rightarrow x = (-\infty, -1] \cup (0, +\infty)$

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

ب) $y = \sqrt{\frac{x^2 - 4x + 3}{x^2 - 1}} \rightarrow x^2 - 1 \neq 0 \Rightarrow (x-1)(x+1) \neq 0 \Rightarrow x \neq \pm 1$
 $\Rightarrow D_f = \mathbb{R} - \{1, -1\}$

الف) $y = \log(x^2 - 2x) \rightarrow x^2 - 2x > 0 \Rightarrow (x)(x-2) > 0 \rightarrow \frac{0}{+} \frac{3}{-} \frac{+}{+}$
 $\Rightarrow D_f = \mathbb{R} - [0, 2]$

ب) $y = \log |x-2| \rightarrow (x-2)(x+2) > 0 \rightarrow \frac{-}{+} \frac{+}{-} \frac{-}{+}$
 $\Rightarrow D_f = \mathbb{R} - [0, 2]$

ج) $y = \log \frac{x^2 - 2x + 3}{x^2 - 1} \rightarrow \frac{(x-3)(x-1)}{x^2 - 1} > 0 \rightarrow \frac{3}{+} \frac{1}{-} \frac{+}{+}$
 $\Rightarrow D_f = (-\infty, -2) \cup (2, 4) - \{3, -3\}$

د) $y = \sqrt{x^2 - 1} \log \frac{x^2 - 2x + 3}{x^2 - 1} \rightarrow \frac{(x-3)(x-1)}{x^2 - 1} > 0 \rightarrow \frac{3}{+} \frac{1}{-} \frac{+}{+}$
 $\Rightarrow D_f = (4, 10) - \{9\}$

هـ) $y = \sqrt{x^2 - 1} \log \frac{x^2 - 2x + 3}{x^2 - 1} \rightarrow \frac{(x-3)(x-1)}{x^2 - 1} > 0 \rightarrow \frac{3}{+} \frac{1}{-} \frac{+}{+}$
 $\Rightarrow D_f = (0, 4] - \{1\}$

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

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

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

$y = \sqrt{\frac{x - f(x)}{f(x)}} \rightarrow \frac{x - f(x)}{f(x)} \geq 0 \rightarrow x \geq f(x)$
 $\Rightarrow D_f = (-2, -1] \cup [2, 3]$

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