

(الف) $x^2 - 5x + 6 > 0 \rightarrow (x-2)(x-3) > 0$

Sign chart: $+$ at $x < 2$, $-$ between 2 and 3 , $+$ at $x > 3$.

Solution: $(-\infty, 2) \cup (3, +\infty)$

(ب) $x^2 - 4x + 5 < 0 \rightarrow \frac{c}{a} = 5$

Sign chart: $+$ at $x < 1$, $-$ between 1 and 5 , $+$ at $x > 5$.

Solution: $(1, 5)$

(ج) $x^2 + 4x + 5 > 0 \rightarrow \frac{-4 \pm \sqrt{16-20}}{2} = \frac{-4 \pm 2i}{2} = -2 \pm i$

Sign chart: $+$ at $x < -5$, $-$ between -5 and -1 , $+$ at $x > -1$.

Solution: $(-\infty, -5] \cup [-1, +\infty)$

(د) $x^2 - 7x + 4 < 0 \rightarrow \frac{c}{a} = 4$

Sign chart: $+$ at $x < 1$, $-$ between 1 and 4 , $+$ at $x > 4$.

Solution: $(1, 4)$

(الف) $\frac{x^2 - 3x + 2}{x - 5} < 0$

Sign chart for $\frac{x^2 - 3x + 2}{x - 5}$: $-$ at $x < 1$, $+$ between 1 and 2 , $-$ between 2 and 5 , $+$ at $x > 5$.

Solution: $(-\infty, 1) \cup (2, 5)$

(ب) $\frac{x^2 - 1}{x^2 - 4x + 5} \geq 0$

Sign chart for $\frac{x^2 - 1}{x^2 - 4x + 5}$: $+$ at $x < -1$, $-$ between -1 and 1 , $-$ between 1 and 5 , $+$ at $x > 5$.

Solution: $(-\infty, -1] \cup (5, +\infty)$

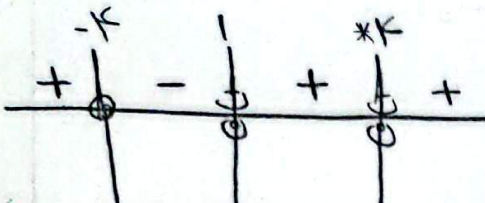
(الف) $y = \sqrt{\frac{x^3 - 1}{x^3 - x}}$

Domain conditions: $x^3 - x \neq 0$, $x(x^2 - 1) \neq 0$, $x(x-1)(x+1) \neq 0$.

Sign chart for $\frac{x^3 - 1}{x^3 - x}$: $+$ at $x < -1$, $-$ between -1 and 0 , $+$ between 0 and 1 , $+$ at $x > 1$.

Solution: $D_f = (1, +\infty) \cup (0, 1) \cup (-\infty, -1)$

$\psi) y = \sqrt{x^2 - 14}$ $\rightarrow \frac{x^2 - 14}{x^2 - 5x + 2} \geq 0 \quad \frac{(x-4)(x+1)}{(x-2)(x-1)} \geq 0$


 $D_f = (-\infty, -1) \cup (1, 2) \cup (4, \infty)$

الف) $y = \sqrt{1-x} \sqrt{2-x}$

$D_f = [-1, 2]$

① $1-x \geq 0 \quad x \leq 1$
 ② $2-x \geq 0 \quad \sqrt{1-x} \leq 1 \quad 1-x \leq 1 \quad -x \leq 0 \rightarrow x \geq 0$
 $-1 \leq x \leq 2$

ب) $y = \sqrt{1-x} \sqrt{x-2}$

① $x-2 \geq 0 \quad x \geq 2$
 ② $1-x \geq 0 \quad \sqrt{x-2} \leq 1 \quad x-2 \leq 1 \quad x \leq 3$
 $D_f = [2, 3]$

الف) $y = \sqrt{1-x^2}$

$1-x^2 \geq 0 \quad x^2 \leq 1 \quad x \leq 1 \quad -1 \leq x \leq 1$
 $D_f = [-1, 1]$

ب) $\sqrt{3|x| - 9}$

$3|x| - 9 \geq 0 \quad 3|x| \geq 9 \quad |x| \geq 3 \quad x \geq 3 \text{ or } x \leq -3$
 $D_f = (-\infty, -3] \cup [3, \infty)$

الف) $y = \frac{\sqrt[3]{|x|+1}}{|x|-3}$

$|x|-3 \neq 0 \quad |x| \neq 3 \quad x \neq \pm 3$
 $D_f = \mathbb{R} - \{\pm 3\}$

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

$x \geq 0 \quad \sqrt{x}-3 \neq 0 \quad \sqrt{x} \neq 3 \quad x \neq 9$
 $D_f = [0, \infty) - \{9\}$

الف) $y = \frac{\sin x}{\cos x - 1}$

$\cos x - 1 \neq 0 \quad \cos x \neq 1 \quad \cos x \neq \frac{1}{1}$
 $D_f = \mathbb{R} - \{k\pi, k\pi - \frac{\pi}{2}\}$

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

$\sin x + 1 \neq 0 \quad \sin x \neq -1$
 $D_f = \mathbb{R} - \{k\pi + \frac{3\pi}{2}\}$

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

$\tan x = \frac{\sin}{\cos} \rightarrow \cos \neq 0 \quad \cot x = \frac{\cos}{\sin} \rightarrow \sin \neq 0$
 $D_f = \mathbb{R} - \{k\pi, k\pi + \frac{\pi}{2}, k\pi + \frac{3\pi}{2}\}$

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

$\cos x - 3 \neq 0 \quad \cos x \neq 3$
 $D_f = \mathbb{R}$

$$y = \frac{1}{\sqrt{\gamma|x-\gamma| - \frac{1}{\gamma}}}$$

$$\gamma|x-\gamma| - \frac{1}{\gamma} > 0$$

$$\gamma|x-\gamma| > \frac{1}{\gamma} \rightarrow |x-\gamma| > \frac{1}{\gamma}$$

$$\begin{aligned} & \frac{1}{\gamma} \uparrow \\ & x - \gamma > \frac{1}{\gamma} \\ & x - \gamma < -\frac{1}{\gamma} \\ & x < \gamma + \frac{1}{\gamma} \end{aligned}$$

$$D_f = (-\infty, \frac{\gamma}{\gamma}) \cup (\frac{1}{\gamma} + \gamma, +\infty) \cup \{ \frac{\gamma}{\gamma} \}, \quad x < \frac{\gamma}{\gamma}$$

$$g = \sqrt{\gamma - \gamma|x|}$$

$$\gamma - \gamma|x| \geq 0$$

$$\begin{aligned} \gamma|x| &\leq \gamma \\ |x| &\leq 1 \end{aligned}$$

$$\begin{aligned} x &\leq 1 \\ x &\geq -1 \end{aligned} \quad \left\{ \begin{array}{l} x \leq 1 \\ x \geq -1 \end{array} \right\} \rightarrow -1 \leq x \leq 1$$

$$D_f = [-1, 1]$$

$$c) \quad y = \sqrt{\frac{|x|}{|x|}} \rightarrow +\infty \quad \left\{ \begin{array}{l} +\infty \\ +\infty \end{array} \right\} \rightarrow x \neq 0 \quad D_f = \{x \neq 0\}$$