



الف) $(x-2)(x-2) > 0$ $\frac{2}{+} \frac{2}{-} \frac{2}{+}$ $(-\infty, 2) \cup (2, +\infty)$

ب) $(x-1)(x-5) < 0$ $\frac{1}{+} \frac{5}{-} \frac{5}{+}$ $(1, 5)$

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

د) $(x-1)(x-3) \leq 0$ $\frac{1}{+} \frac{3}{-} \frac{3}{+}$ $[1, 3]$

الف) $\frac{(x-1)(x-2)}{x-5} < 0$ $\frac{1}{-} \frac{2}{+} \frac{5}{-}$ $(-\infty, 1) \cup (2, 5)$

ب) $\frac{(x-1)(x+1)}{(x-1)(x-5)} \geq 0$ $\frac{-1}{+} \frac{1}{-} \frac{5}{-}$ $(-\infty, -1] \cup (5, +\infty)$

الف) $\frac{x^3-1}{x^3-x} \geq 0$ $\frac{-1}{+} \frac{0}{-} \frac{1}{+}$ $D_f = (-\infty, -1) \cup (0, 1) \cup (1, +\infty)$
 $\bullet \leftarrow x(x^2-1) \rightarrow \pm 1$

$x = \pm 1$

ب) $\frac{x^3-16}{x^3-5x+4} \geq 0$ $\frac{-4}{+} \frac{1}{-} \frac{4}{+}$ $D_f = (-\infty, -4] \cup (1, 4) \cup (4, +\infty)$
 $\bullet \leftarrow (x-4)(x-1) \rightarrow 1$

الف) $2-x \geq 0 \Rightarrow x \leq 2$ ① $4-\sqrt{2-x} \geq 0 \Rightarrow \sqrt{2-x} \leq 4 \Rightarrow 2-x \leq 16$
 $x \geq -14$ ②
 $①, ② \Rightarrow -14 \leq x \leq 2 \Rightarrow D_f = [-14, 2]$

ب) $x-2 \geq 0 \Rightarrow x \geq 2$ ① $3-\sqrt{x-2} \geq 0 \Rightarrow \sqrt{x-2} \leq 3 \Rightarrow x-2 \leq 9$
 $x \leq 11$ ②

①, ② $\Rightarrow 2 \leq x \leq 11 \Rightarrow D_f = [2, 11]$

الف) $\epsilon - 2x^2 \geq 0 \Rightarrow 2x^2 \leq \epsilon \Rightarrow x^2 \leq \frac{\epsilon}{2} \Rightarrow -\sqrt{\frac{\epsilon}{2}} \leq x \leq \sqrt{\frac{\epsilon}{2}} \quad D_f = \left[-\sqrt{\frac{\epsilon}{2}}, \sqrt{\frac{\epsilon}{2}}\right]$

ب) $x|x| - 9 \geq 0 \Rightarrow x|x| \geq 9 \Rightarrow x > 3 \quad D_f = (-\infty, -3] \cup [3, +\infty)$
 $|x| > 3 \Rightarrow x \leq -3$

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

ب) $\sqrt{x} - 3 \neq 0 \Rightarrow \sqrt{x} \neq 3 \Rightarrow x \neq 9 \quad D_f = [0, +\infty) - \{9\}$
 $x > 0$

الف) $2\cos x - 1 \neq 0 \Rightarrow 2\cos x \neq 1 \Rightarrow \cos x \neq \frac{1}{2} \Rightarrow x \neq \frac{\pi}{3}, \frac{5\pi}{3} \quad D_f = \mathbb{R} - \left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$

ب) $2\sin x + 1 \neq 0 \Rightarrow 2\sin x \neq -1 \Rightarrow \sin x \neq -\frac{1}{2} \Rightarrow x \neq \frac{7\pi}{6}, \frac{11\pi}{6} \quad D_f = \mathbb{R} - \left\{\frac{7\pi}{6}, \frac{11\pi}{6}\right\}$

ج) $\begin{cases} \tan x \rightarrow \frac{\sin x}{\cos x} \rightarrow \cos x \neq 0 \rightarrow x \neq k\pi + \frac{\pi}{2} \\ \cot x \rightarrow \frac{\cos x}{\sin x} \rightarrow \sin x \neq 0 \rightarrow x \neq k\pi \end{cases} \quad D_f = \mathbb{R} - \left\{k\pi + \frac{\pi}{2}, k\pi\right\}$

د) $\sin^2 x - \frac{1}{4} \neq 0 \Rightarrow \sin^2 x \neq \frac{1}{4} \Rightarrow \sin x \neq \pm \frac{1}{2} \Rightarrow x \neq \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \quad D_f = \mathbb{R} - \left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}\right\}$

$x|x - 2| - \frac{1}{x} > 0$

$x|x - 2| > \frac{1}{x} \Rightarrow |x - 2| > \frac{1}{x} \Rightarrow x - 2 > \frac{1}{x} \Rightarrow x > \frac{1}{x - 2} \quad D_f = (-\infty, \frac{1}{x - 2}) \cup (\frac{1}{x - 2}, +\infty)$
 $x - 2 < -\frac{1}{x} \Rightarrow x < \frac{1}{2 - x}$

الف) $f - 2|x| \geq 0 \Rightarrow 2|x| \leq f \Rightarrow |x| \leq \frac{f}{2} \Rightarrow -\frac{f}{2} \leq x \leq \frac{f}{2} \quad D_f = \left[-\frac{f}{2}, \frac{f}{2}\right]$

ب) $\frac{|x|}{|x|} \geq 0 \quad x \neq 0 \quad D_f = \mathbb{R} - \{0\}$