

الف) $\sqrt{x^2 - 4x} \rightarrow x(x-4) \geq 0$
 $x^2 - x \rightarrow x(x-1)(x+1)$
 $x^2 - x \rightarrow x(x-1)(x+1)$

ب) $\sqrt{x^2 - x} \rightarrow x(x-1) \geq 0$
 $x^2 - x \rightarrow x(x-1)(x+1)$

نقطه‌های بحرانی: $-1, 0, 1$
 $D_f = (-1, 0) \cup (0, 1) \cup [1, +\infty)$

نقطه‌های بحرانی: $-1, 0, 1$
 $D_f = \mathbb{R} - \{0, \pm 1\}$

الف) $\frac{x+1}{\sqrt{x+|x|}} \rightarrow x+|x| > 0 \Rightarrow x > 0 \Rightarrow D_f = \mathbb{R}^+$

ب) $\frac{1}{\sqrt{|x|}} \rightarrow |x| > 0 \Rightarrow x \neq 0 \Rightarrow D_f = \mathbb{R}^+$

الف) $\sqrt{2-x} \rightarrow 2-x \geq 0 \Rightarrow x \leq 2 \Rightarrow D_f = (-\infty, 2]$

ب) $\frac{1}{\sqrt{2-x}} \rightarrow 2-x > 0 \Rightarrow x < 2 \Rightarrow D_f = (-\infty, 2)$

الف) $[x - \frac{1}{e}] + [x + \frac{1}{e}] \geq 0 \Rightarrow [x - \frac{1}{e}] + 1 + [x + \frac{1}{e}] \geq 1 \Rightarrow 2[x + \frac{1}{e}] \geq 1 \Rightarrow [x + \frac{1}{e}] \geq \frac{1}{2}$
 $x + \frac{1}{e} \geq \frac{1}{2} \Rightarrow x \geq \frac{1}{e} \Rightarrow D_f = [\frac{1}{e}, +\infty)$

ب) $[x - \frac{1}{e}] + [- (x - \frac{1}{e})] \geq 0 \Rightarrow [a] + [-a] \stackrel{\text{if } a \in \mathbb{Z}}{=} 0 \checkmark \rightarrow x - \frac{1}{e} \in \mathbb{Z} \Rightarrow x \in \mathbb{Z} + \frac{1}{e}$
 $[a] + [-a] \stackrel{\text{if } a \notin \mathbb{Z}}{=} -1 \times$
 $D_f = \{x \mid x = k + \frac{1}{e}, k \in \mathbb{Z}\}$

الف) $y = \frac{1}{\sin x - 1} \rightarrow \sin x \neq 1 \Rightarrow x \neq 2\pi \leq \frac{\pi}{2} \Rightarrow D_f = \mathbb{R} - \{2k\pi + \frac{\pi}{2}\}$

ب) $y = \frac{1}{1 - \sin^2 x} \rightarrow 1 - \sin^2 x \neq 0 \Rightarrow \sin^2 x \neq 1 \Rightarrow \sin x \neq \pm 1 \Rightarrow \sin x \neq \pm \frac{1}{1} \Rightarrow \sin x \neq \pm 1$
 $x \neq 60^\circ, 120^\circ, 240^\circ, 300^\circ$
 $D_f = \mathbb{R} - \{k\pi + \frac{\pi}{2}, k\pi + \frac{3\pi}{2}\}$

$$\text{a)} y = \sqrt{x \sin x - 1} \Rightarrow x \sin x - 1 \geq 0 \Rightarrow x \sin x \geq 1 \Rightarrow \sin x \geq \frac{1}{x} \rightarrow \text{Unit Circle Diagram}$$

$$D_f = \left[2k\pi + \frac{\pi}{4}, 2k\pi + \frac{3\pi}{4} \right]$$

✓

$$\text{b)} y = \sqrt{\cos x - 1} \Rightarrow \cos x - 1 \geq 0 \Rightarrow \cos x \geq 1 \Rightarrow \text{نقطه } 0^\circ$$

$$D_f = \{ 2k\pi \}$$

$$\text{a)} \cos y = |x| - r \Rightarrow -1 \leq |x| - r \leq 1 \Rightarrow r \leq |x| \leq r+1 \Rightarrow D_f = [-r, -r] \cup [r, r+1]$$

✓

$$\text{b)} y = \arcsin(x^2 + 2x + 1) \Rightarrow -1 \leq x^2 + 2x + 1 \leq 1 \Rightarrow 0 \leq x^2 + 2x \leq 0 \Rightarrow x(x+2) \leq 0$$

$$\text{① } x(x+2) \leq 0 \Rightarrow x^2 + 2x \leq 0 \Rightarrow x(x+2) \leq 0 \Rightarrow x \in [-2, 0]$$

$$\text{② } x(x+2) \geq 0 \Rightarrow x^2 + 2x \geq 0 \Rightarrow x(x+2) \geq 0 \Rightarrow x \in (-\infty, -2] \cup [0, \infty)$$

$$\sqrt{x-1} \log x \rightarrow x-1 > 0 \Rightarrow x > 1$$

$$x-1 \log x \rightarrow x-1 \log x > 0 \Rightarrow \log x \leq 1 \Rightarrow x-1 \leq 9 \Rightarrow x \leq 11$$

$$D_f = (1, 11]$$

✓

$$\text{b)} \log(x^2 - x) \Rightarrow x(x-1)(x+1) > 0 \Rightarrow x \in (-1, 0) \cup (1, \infty)$$

$$\text{a)} y = \frac{x}{x^2 + 1} \Rightarrow x^2 > 0 \Rightarrow D_f = \mathbb{R}$$

$$\text{b)} y = \frac{x}{x^2 - 1} \Rightarrow x \neq 1 \Rightarrow x \neq 0 \Rightarrow D_f = \mathbb{R} - \{0\}$$

✓

$$\text{c)} y = \frac{x}{x^2 - x} \Rightarrow x \neq x \Rightarrow x \neq \frac{1}{x} \Rightarrow D_f = \mathbb{R} - \left\{ \frac{1}{x} \right\} \subseteq \mathbb{R} - \left\{ \log \frac{x}{x} \right\}$$

$$\text{d)} y = \frac{x}{x^2 - e} \Rightarrow x \neq x \Rightarrow \log \frac{x}{x} \neq x \Rightarrow D_f = \mathbb{R} - \left\{ \log \frac{x}{x} \right\}$$

$$\text{a)} (x+1)! \Rightarrow x+1 \in \mathbb{W} \Rightarrow \frac{x-1}{x} = x \Rightarrow D_f = \left\{ x \mid x = \frac{k-1}{x}, k \in \mathbb{W} \right\}$$

$$\text{b)} \left(\frac{x^2 - x}{x^2 - a} \right)! \Rightarrow \frac{x^2 - x}{x^2 - a} \in \mathbb{W} \Rightarrow \frac{-a + x}{x^2 - a} = \frac{a + x}{x^2 - a}$$

$$D_f = \left\{ x \mid x = \frac{ak - x}{x^2 - a}, k \in \mathbb{W} \right\}$$