

$$y = \sqrt{\frac{x^2 - 9x}{x^3 - x}} \Rightarrow \begin{cases} \frac{x^2 - 9x}{x^3 - x} \geq 0 \Rightarrow \frac{x(x-9)}{x(x-1)(x+1)} \geq 0 \\ x^3 - x \neq 0 \Rightarrow x(x-1)(x+1) \neq 0 \end{cases}$$

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

$$y = \sqrt{\frac{x^5 - x^3}{x^3 - x}} \Rightarrow y = \sqrt{\frac{x^3(x+1)(x-1)}{x(x-1)(x+1)}} = \sqrt{x}$$

$D_f = (-\infty, +\infty) \setminus \{-1, 0, 1\}$

الف)  $y = \frac{x+1}{\sqrt{x+|x|}} \Rightarrow \begin{cases} \sqrt{x+|x|} \neq 0 \\ x+|x| \geq 0 \end{cases} \Rightarrow x+|x| > 0 \Rightarrow D_f = \mathbb{R}^+$

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

الف)  $y = \sqrt{2 - [x]} \Rightarrow 2 - [x] \geq 0 \Rightarrow [x] \leq 2 \Rightarrow D_f = (-\infty, 3)$

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

$D_f = [\frac{1}{2}, +\infty)$

الف)  $y = \sqrt{[x - \frac{1}{2}] + [x + \frac{1}{2}]} \Rightarrow [x - \frac{1}{2}] + [x + \frac{1}{2}] \geq 0 \Rightarrow 2[x + \frac{1}{2}] \geq 0$

$\Rightarrow [x + \frac{1}{2}] \geq 0 \Rightarrow [x + \frac{1}{2}] \geq 1 \Rightarrow x + \frac{1}{2} \geq 1 \Rightarrow x \geq \frac{1}{2}$

ب)  $y = \sqrt{[x - \frac{1}{2}] + [-x + \frac{1}{2}]} \Rightarrow [x - \frac{1}{2}] + [-x + \frac{1}{2}] = 0$

$\Rightarrow x - \frac{1}{2} \in \mathbb{Z} \quad D_f = \{x | x = k + \frac{1}{2}, k \in \mathbb{Z}\}$

الف)  $y = \frac{2}{\sin x - 1} \Rightarrow \sin x \neq 1$

$D_f = \mathbb{R} - \{k\pi + \frac{\pi}{2}\}$

ب)  $y = \frac{3}{2 \sin^2 x - 1} \Rightarrow \sin^2 x \neq \frac{1}{2} \Rightarrow \sin x \neq \pm \frac{\sqrt{2}}{2}$

$D_f = \mathbb{R} - \{k\pi + \frac{\pi}{4}, k\pi + \frac{3\pi}{4}\}$

$$\text{ا) } y = \sqrt{2 \sin x - 1} \Rightarrow 2 \sin x - 1 \geq 0 \Rightarrow \sin x \geq \frac{1}{2}$$

$$\text{ب) } y = \sqrt{\cos x - 1} \Rightarrow \cos x = 1 \Rightarrow D_f = \{2k\pi\}$$

| $x$            | $-2$ | $-1$ |
|----------------|------|------|
| $x^2 + 2x + 1$ | $+$  | $-$  |

| $x$        | $-3$ | $0$ |
|------------|------|-----|
| $x^2 + 3x$ | $+$  | $-$ |

$$\text{ا) } \cos y = |x| - 3 \Rightarrow -1 \leq |x| - 3 \leq 1 \Rightarrow 2 \leq |x| \leq 4$$

$$\Rightarrow \begin{cases} 2 \leq x \leq 4 \\ -4 \leq x \leq -2 \end{cases} \quad D_f = [2, 4] \cup [-4, -2]$$

$$\text{ب) } y = \arcsin(x^2 + 3x + 1) \Rightarrow -1 \leq x^2 + 3x + 1 \leq 1 \Rightarrow$$

$$D_f = [-3, -1] \cup [-1, 0]$$

$$(x+1)(x+2) \geq 0$$

$$\begin{cases} x^2 + 3x + 2 \geq 0 \\ x^2 + 3x \leq 0 \\ x(x+3) \leq 0 \end{cases}$$

$$\text{ا) } y = \sqrt{2 - \log_3(x-2)} \Rightarrow 2 - \log_3(x-2) \geq 0 \Rightarrow \log_3(x-2) \leq 2$$

$$\Rightarrow x-2 \leq 9 \Rightarrow x \leq 11$$

$$D_f = (2, 11]$$

$$\text{II } x-2 > 0 \Rightarrow x > 2$$

$$\text{ب) } y = \log(x^3 - x) \Rightarrow x(x-1)(x+1) > 0$$

| $x$       | $-1$ | $0$ | $1$ |
|-----------|------|-----|-----|
| $x^3 - x$ | $-$  | $+$ | $-$ |

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

$$\text{ا) } y = \frac{3}{x^2 + 1} \Rightarrow D_f = \mathbb{R}$$

$$\text{ب) } y = \frac{3}{x^2 - 1} \Rightarrow x^2 \neq 1 \Rightarrow x \neq \pm 1 \Rightarrow D_f = \mathbb{R} - \{\pm 1\}$$

$$\text{ج) } y = \frac{3}{x^2 - 2} \Rightarrow x^2 \neq 2 \Rightarrow x \neq \pm \sqrt{2} \Rightarrow D_f = \mathbb{R} - \{\pm \sqrt{2}\}$$

$$\text{د) } y = \frac{3}{x^2 - 3} \Rightarrow x^2 \neq 3 \Rightarrow D_f = \mathbb{R} - \{\pm \sqrt{3}\}$$

$$\text{ا) } y = (x+1)! \Rightarrow x+1 \in \mathbb{N} \Rightarrow D_f = \{x | x = \frac{k-1}{1}\}$$

$$\text{و } k \in \mathbb{N}$$

$$\text{ب) } y = \left(\frac{3x-2}{2x-5}\right)! \Rightarrow \frac{3x-2}{2x-5} \in \mathbb{N} \Rightarrow D_f = \{x | x = \frac{5k-2}{3}\}$$

$$\text{و } k \in \mathbb{N}$$