

(۱)

$$\text{الف) } y = \frac{x+3}{2x^3+3x^2-12x+10} \Rightarrow \frac{2x^3+3x^2-12x+10}{-2x^3+3x^2-12x+10} \Rightarrow \frac{x-1}{2x^3+3x^2-12x+10} \Rightarrow \mathcal{D}_y = \mathbb{R} - \left\{-3, \frac{1}{2}, 1\right\}$$

$$\Rightarrow 2x^3+3x^2-12x+10=0 \Rightarrow x^3+\frac{3}{2}x^2-6x+5=0$$

$$\Rightarrow (x-1)(x^2+\frac{5}{2}x-5)=0 \Rightarrow x=\frac{1}{2}, -5 \Rightarrow x=1$$

$$\text{ب) } y = \frac{x+3}{2x^3+9x^2+10x+4} \Rightarrow \frac{2x^3+9x^2+10x+4}{-2x^3+9x^2+10x+4} \Rightarrow \frac{x+1}{2x^3+9x^2+10x+4} \Rightarrow \mathcal{D}_y = \mathbb{R} - \left\{-3, -1, -\frac{1}{2}\right\}$$

$$\Rightarrow 2x^3+9x^2+10x+4=0 \Rightarrow x^3+\frac{9}{2}x^2+5x+2=0$$

$$\Rightarrow (x+1)(x^2+\frac{7}{2}x+2)=0 \Rightarrow x=-\frac{1}{2}, -3 \Rightarrow x=-1$$

(۲)

$$\text{الف) } y = \frac{x+3}{x^3-2x^2+2x-1} \Rightarrow \frac{x^3-2x^2+2x-1}{-x^3+2x^2-2x+1} \Rightarrow \frac{x-1}{x^3-2x^2+2x-1} \Rightarrow \mathcal{D}_y = \mathbb{R} - \{1\}$$

$$\Rightarrow x^3-2x^2+2x-1=0 \Rightarrow 1-2+2-1=0 \Rightarrow \Delta < 0$$

$$\Rightarrow \text{یک ریشه دارد} \Rightarrow x=1$$

$$\text{ب) } y = \sqrt{\frac{x+3}{x^3-2x^2+2x-1}} \Rightarrow \frac{x+3}{x^3-2x^2+2x-1} \geq 0 \Rightarrow \frac{x+3}{x^3-2x^2+2x-1} \geq 0 \Rightarrow \frac{x+3}{(x-1)(x^2-x+1)} \geq 0 \Rightarrow \mathcal{D}_y = (-\infty, -3] \cup (1, +\infty)$$

نقطه تقاطع با محور افقی: $x = -3$
نقطه تقاطع با محور عمودی: $x = 1$

(۳)

$$y = \frac{1}{x^2-\Delta|x-1|-2x+\Delta} \rightarrow x^2-\Delta|x-1|-2x+\Delta \neq 0 \xrightarrow{x \leq 1} x^2-\Delta x+\Delta-2x+\Delta=0 \rightarrow x^2-(\Delta+2)x+2\Delta=0 \rightarrow (x-2)(x-\Delta)=0 \rightarrow x=2, \Delta$$

$$\xrightarrow{x > 1} x^2-\Delta+\Delta x-2x+\Delta=0 \rightarrow x^2+\Delta x-2x=0 \rightarrow x(x+\Delta-2)=0 \rightarrow x=0, -\Delta$$

$$\Rightarrow \mathcal{D}_y = \mathbb{R} - \{-3, 0, 2, \Delta\}$$

(۴)

$$\text{الف) } y = \sqrt{[-x]-2} \rightarrow [-x]-2 \geq 0 \rightarrow [-x] \geq 2 \rightarrow x \leq -2 \rightarrow \mathcal{D}_y = (-\infty, -2]$$

$$\text{ب) } y = \frac{\Delta x^2+4}{[x]^2-2[x]-3} \rightarrow [x]^2-2[x]-3 \neq 0 \rightarrow t^2-2t-3=0 \rightarrow (t-3)(t+1)=0 \rightarrow t=3, -1$$

$$\Rightarrow [x]=3 \rightarrow 3 \leq x < 4 \Rightarrow [x]=-1 \rightarrow -1 \leq x < 0 \rightarrow \mathcal{D}_y = \mathbb{R} - ([-1, 0) \cup [3, 4])$$

(۵)

$$\text{الف) } y = \sqrt{\left[x-\frac{1}{3}\right]+\left[x+\frac{1}{3}\right]} \rightarrow \left[x-\frac{1}{3}\right]+\left[x+\frac{1}{3}\right] \geq 0 \rightarrow \left[x+\frac{1}{3}-1\right]+\left[x+\frac{1}{3}\right] \geq 0 \rightarrow \left[x+\frac{1}{3}\right]-1+\left[x+\frac{1}{3}\right] \geq 0$$

$$\Rightarrow 2\left[x+\frac{1}{3}\right] \geq 1 \rightarrow \left[x+\frac{1}{3}\right] \geq \frac{1}{2} \rightarrow x+\frac{1}{3} \geq 1 \rightarrow x \geq \frac{2}{3} \rightarrow \mathcal{D}_y = \left[\frac{2}{3}, +\infty\right)$$

$$\text{ب) } y = \sqrt{\left[x-\frac{1}{3}\right]+\left[\frac{1}{3}-x\right]} \rightarrow y = \sqrt{\left[x-\frac{1}{3}\right]+[-(x-\frac{1}{3})]} \rightarrow \begin{cases} a \in \mathbb{Z} & [a]+[-a]=0 \\ a \notin \mathbb{Z} & [a]+[-a]=-1 \end{cases} \Rightarrow x-\frac{1}{3} \in \mathbb{Z}$$

$$\Rightarrow \mathcal{D}_y = \left\{x \mid x = k + \frac{1}{3}, k \in \mathbb{Z}\right\}$$

s.a.m

$$\text{الف) } y = \frac{\cot x + 1}{\tan x + 1} \rightarrow \cot x = \frac{\cos x}{\sin x} \rightarrow \sin x \neq 0 \rightarrow x \neq k\pi \quad (k \in \mathbb{Z})$$

$$\rightarrow \tan x = \frac{\sin x}{\cos x} \rightarrow \cos x \neq 0 \rightarrow x \neq \frac{\pi}{2} + k\pi \quad (k \in \mathbb{Z}) \Rightarrow \mathcal{D}_f = \mathbb{R} - \left\{ k\pi, k\pi + \frac{\pi}{2}, k\pi + \frac{3\pi}{2} \right\}$$

$$\rightarrow \tan x + 1 \neq 0 \rightarrow \tan x \neq -1 \rightarrow x \neq \frac{3\pi}{4} + k\pi \quad (k \in \mathbb{Z})$$



$$\text{ب) } y = \sqrt{1 - \varepsilon \sin^2 x} \rightarrow 1 - \varepsilon \sin^2 x \geq 0 \rightarrow \varepsilon \sin^2 x \leq 1 \rightarrow \sin^2 x \leq \frac{1}{\varepsilon} \rightarrow |\sin x| \leq \frac{1}{\sqrt{\varepsilon}} \rightarrow -\frac{1}{\sqrt{\varepsilon}} \leq \sin x \leq \frac{1}{\sqrt{\varepsilon}}$$

$$\Rightarrow \mathcal{D}_f = \left[k\pi - \frac{\pi}{4}, k\pi + \frac{\pi}{4} \right]$$



$$\text{الف) } y = \sqrt{2 \sin x - 1} \rightarrow 2 \sin x - 1 \geq 0 \rightarrow 2 \sin x \geq 1 \rightarrow \sin x \geq \frac{1}{2} \rightarrow \mathcal{D}_f = \left[2k\pi + \frac{\pi}{6}, 2k\pi + \frac{5\pi}{6} \right]$$



$$\text{ب) } y = \sqrt{1 - 2 \cos x} \rightarrow 1 - 2 \cos x \geq 0 \rightarrow 2 \cos x \leq 1 \rightarrow \cos x \leq \frac{1}{2} \rightarrow \mathcal{D}_f = \left[2k\pi + \frac{2\pi}{3}, 2k\pi + \frac{4\pi}{3} \right]$$



$$\text{الف) } y = \arcsin(x^2 + 3x + 1) \rightarrow -1 \leq x^2 + 3x + 1 \leq 1 \rightarrow x^2 + 3x + 1 \geq 0 \rightarrow (x+1)(x+2) \geq 0 \rightarrow \frac{-2}{-1-1+} \quad (1)$$

$$\Rightarrow x^2 + 3x \leq 0 \rightarrow x(x+3) \leq 0 \rightarrow \frac{+3}{-1-1+} \Rightarrow \mathcal{D}_f = [-3, -1] \cup [-1, 0]$$

$$\text{ب) } \cos y = \sqrt{\Delta - 2x} \rightarrow \Delta - 2x \geq 0 \rightarrow 2x \leq \Delta \rightarrow x \leq \frac{\Delta}{2} \quad (I)$$

$$\text{III} \Rightarrow \mathcal{D}_f = \left[1, \frac{\Delta}{2} \right]$$

$$\rightarrow y = \arccos \rightarrow \sqrt{\Delta - 2x} \leq 1 \rightarrow \Delta - 2x \leq 1 \rightarrow 2x \geq \Delta - 1 \rightarrow x \geq \frac{\Delta - 1}{2} \quad (II)$$

$$\text{الف) } y = \log_p \left(1 - \log_p \frac{x}{p} \right) \quad 1 - \log_p \frac{x}{p} > 0 \rightarrow \log_p \frac{x}{p} < 1 \rightarrow x < p \quad (I)$$

$$\log_p \frac{x}{p} \rightarrow x > 0 \quad (II)$$

$$I \cap II \rightarrow 0 < x < p \rightarrow \mathcal{D}_f = (0, p)$$

$$\text{ب) } y = \log_p \left(1 - \log_p \frac{x}{p} \right) \quad 1 - \log_p \frac{x}{p} > 0 \rightarrow \log_p \frac{x}{p} < 1 \rightarrow x > \frac{1}{p} \quad (I)$$

$$\log_p \frac{x}{p} \rightarrow x > 0 \quad (II)$$

$$I \cap II \rightarrow x > \frac{1}{p} \rightarrow \mathcal{D}_f = \left(\frac{1}{p}, +\infty \right)$$

$$\text{الف) } y = \sqrt{1^{2x-x^2} - 1} \rightarrow 1^{2x-x^2} - 1 \geq 0 \rightarrow 1^{2x-x^2} \geq 1 \rightarrow 1^{2x-x^2} \geq 1^3 \rightarrow 2x - x^2 \geq 3 \rightarrow x^2 - 2x + 3 \leq 0$$

$$\rightarrow (x-1)(x-3) \leq 0 \rightarrow \frac{1}{+1-1+} \rightarrow \mathcal{D}_f = [1, 3]$$

$$\text{ب) } y = \left(\frac{3x+5}{2x+2} \right)! \rightarrow \frac{3x+5}{2x+2} \in \mathbb{W} \rightarrow x = \frac{-2w+5}{2w-3} \rightarrow \mathcal{D}_f = \left\{ x \mid x = \frac{-2w+5}{2w-3}, w \in \mathbb{W} \right\}$$