

الف) $y = \frac{\sin x - 2}{2 \cos x + 1} \Rightarrow 2 \cos x + 1 \neq 0$
 $2 \cos x \neq -1$
 $\cos x \neq -\frac{1}{2} \Rightarrow D(y) = \mathbb{R} - \left\{ 2k\pi + \frac{2\pi}{3}, 2k\pi + \frac{4\pi}{3} \right\}$

ب) $y = \frac{\sin x + 3}{\cos x - 1} \Rightarrow \cos x - 1 \neq 0$
 $\cos x \neq 1 \Rightarrow D(y) = \mathbb{R} - \{2k\pi\}$

الف) $y = \frac{\sin x + 1}{\tan x + 1} \Rightarrow \tan x + 1 \neq 0$
 $\tan x \neq -1 \Rightarrow \frac{\sin x}{\cos x} \neq -1$
 $\cos x \neq 0$
 $\Rightarrow x \neq \left\{ k\pi + \frac{\pi}{2} \right\}$
 $\Rightarrow D(y) = \mathbb{R} - \left\{ 2k\pi + \frac{\pi}{2}, 2k\pi + \frac{3\pi}{2} \right\}$

ب) $y = \frac{\cos x + 1}{\cot x - 1} \Rightarrow \cot x - 1 \neq 0$
 $\cot x \neq 1$
 $\frac{\cos x}{\sin x} \neq 1 \Rightarrow \sin x \neq \cos x$
 $\Rightarrow D(y) = \mathbb{R} - \left\{ k\pi + \frac{\pi}{4}, k\pi + \frac{5\pi}{4} \right\}$

الف) $\sin y = x^2 - 2 \Rightarrow D(y) = \mathbb{R} - \left\{ k\pi + \frac{\pi}{2}, k\pi + \frac{3\pi}{2} \right\}$
 $\Rightarrow -1 \leq \sin y \leq 1 \Rightarrow -1 \leq x^2 - 2 \leq 1$
 $\Rightarrow 1 \leq x^2 \Rightarrow 1 \leq x$

ب) $y = \arccos(\sqrt{x} - 3)$
 $-1 \leq \sqrt{x} - 3 \leq 1 \Rightarrow 2 \leq \sqrt{x} \leq 4 \Rightarrow 4 \leq x \leq 16$
 $\Rightarrow D(y) = [4, 16]$

الف) $\cos y = |x| - 3 \Rightarrow -1 \leq \cos y \leq 1 \Rightarrow -1 \leq |x| - 3 \leq 1$
 $\Rightarrow 2 \leq |x| \leq 4 \Rightarrow x \leq -2$ or $x \geq 2$
 $\Rightarrow D(y) = (-\infty, -2] \cup [2, \infty)$

ب) $y = \arcsin(x^2 + 2x + 1)$
 $-1 \leq x^2 + 2x + 1 \leq 1$
 $x^2 + 2x \leq 0 \Rightarrow x(x+2) \leq 0 \Rightarrow -2 \leq x \leq 0$
 $\Rightarrow D(y) = [-2, 0]$

الف) $y = \log_3(x^2 - 4)$
 $x^2 - 4 > 0 \Rightarrow x^2 > 4 \Rightarrow x > 2$ or $x < -2$
 $\Rightarrow D(y) = (-\infty, -2) \cup (2, \infty)$

ب) $\log_2(2 - |x|)$
 $2 - |x| > 0 \Rightarrow |x| < 2 \Rightarrow -2 < x < 2$
 $\Rightarrow D(y) = (-2, 2)$

$$\text{الف) } y = \log_{x-3} \omega - x \Rightarrow \omega - x > 0, x - 3 > 0$$

$$\boxed{\omega > x}, \boxed{x > 3}$$

$$x - 3 \neq 1 \Rightarrow x \neq 4$$

$$D(y) = (3, \omega) - \{4\}$$

$$\text{ب) } y = \log_{x+3} x^2 - 1 \Rightarrow x^2 - 1 > 0, x + 3 > 0$$

$$x^2 > 1 \Rightarrow \boxed{x > 1}, \boxed{x < -1}$$

$$x + 3 \neq 1 \Rightarrow \boxed{x \neq -4}$$

$$D(y) = (-3, -1) \cup (1, +\infty)$$

$$\text{الف) } y = \log \frac{x^2 - 4x + 3}{x - 3} \Rightarrow \frac{x^2 - 4x + 3}{x - 3} > 0$$

$$\text{ب) } y = \log \frac{x+3}{x-2} \Rightarrow \frac{x+3}{x-2} > 0$$

$$(x+3)(x-2) > 0$$

$$\boxed{x < -3}, \boxed{x > 2}$$

$$x+3 \neq 0 \Rightarrow \boxed{x \neq -3}$$

$$x-2 \neq 0 \Rightarrow \boxed{x \neq 2}$$

$$D(y) = (-\infty, -3) \cup (2, +\infty)$$

$$\text{الف) } y = \sqrt{3 - \log_r^{x-2}} \Rightarrow x - 2 > 0, 3 - \log_r^{x-2} \geq 0$$

$$x > 2, 3 \geq \log_r^{x-2}$$

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

$$\log_r^x > 1 \Rightarrow x > r$$

$$D(y) = (r, +\infty)$$

$$\text{الف) } y = \frac{3}{x^x + 1} \Rightarrow x^x \neq -1 \Rightarrow \text{مستحيل}$$

$$D(y) = \mathbb{R}$$

$$\text{ب) } y = \frac{3}{x^x - 1} \Rightarrow x^x \neq 1 \Rightarrow x \neq 0 \Rightarrow D(y) = \mathbb{R} - \{0\}$$

$$\text{ج) } y = \frac{3}{x^x - 2} \Rightarrow x^x \neq 2 \Rightarrow x \neq \frac{1}{2} \Rightarrow D(y) = \mathbb{R} - \{\frac{1}{2}\}$$

$$\text{د) } y = \frac{3}{x^x - 3} \Rightarrow x^x \neq 3 \Rightarrow x \neq \log_{\frac{1}{e}} 3$$

$$D(y) = \mathbb{R} - \{\log_{\frac{1}{e}} 3\}$$

$$\text{الف) } y = (\varepsilon x + 1)! \Rightarrow \varepsilon x + 1 \in \mathbb{N}$$

$$x \in \frac{\mathbb{N}}{\varepsilon} - 1 \Rightarrow D(y) = \{x \mid x = \frac{k}{\varepsilon} - 1, k \in \mathbb{N}\}$$

$$\text{ب) } y = (\frac{rx - 2}{rx - \omega})! \Rightarrow \frac{rx - 2}{rx - \omega} \in \mathbb{N}$$

$$rx - 2 \in rx\omega - \omega\omega$$

$$rx - r\omega \in -\omega\omega + 2$$

$$x(r - r\omega) \in -\omega\omega + 2$$

$$D(y) = \{x \mid x \in \frac{-\omega\omega + 2}{r - r\omega}, k \in \mathbb{N}\} = x \in \frac{-\omega\omega + 2}{r - r\omega}$$