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

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

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

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

الف) $\sin y = x^2 - 2 \Rightarrow -1 \leq x^2 - 2 \leq 1 \Rightarrow 1 \leq x^2 \leq 3 \Rightarrow \left\{ \begin{array}{l} -1 \leq x \leq \sqrt{3} \\ 1 \leq x \leq \sqrt{3} \end{array} \right\} D_f = [-\sqrt{3}, -1] \cup [1, \sqrt{3}]$

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ب) $y = \arccos(\sqrt{x} - 2) \Rightarrow -1 \leq \sqrt{x} - 2 \leq 1 \Rightarrow 2 \leq \sqrt{x} \leq 3 \Rightarrow 4 \leq x \leq 9 \Rightarrow D_f = [4, 9]$

الف) $\cos y = |x| - 3 \Rightarrow -1 \leq |x| - 3 \leq 1 \Rightarrow 2 \leq |x| \leq 4 \Rightarrow \left\{ \begin{array}{l} -4 \leq x \leq -2 \\ 2 \leq x \leq 4 \end{array} \right\} D_f = [-4, -2] \cup [2, 4]$

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ب) $y = \arcsin(x^2 + 3x + 1) \Rightarrow -1 \leq x^2 + 3x + 1 \leq 1 \Rightarrow -2 \leq x^2 + 3x \leq 0 \Rightarrow \left\{ \begin{array}{l} x^2 + 3x \leq 0 \Rightarrow x(x+3) \leq 0 \\ -2 \leq x^2 + 3x \Rightarrow 0 \leq x^2 + 3x + 2 = (x+1)(x+2) \end{array} \right.$

$\frac{-3}{+} - \frac{0}{-} + \frac{-2}{+} - \frac{1}{-} + \Rightarrow D_f = [-2, -1] \cup [1, 0]$

الف) $y = \log_{\frac{1}{2}}(x^2 - 4) \Rightarrow x^2 - 4 > 0 \Rightarrow (x+2)(x-2) > 0 \Rightarrow \left\{ \begin{array}{l} x > 2 \\ x < -2 \end{array} \right\} D_f = (-\infty, -2) \cup (2, +\infty)$

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ب) $y = \log_{\frac{1}{2}}(x^2 - |x|) \Rightarrow x^2 - |x| > 0 \Rightarrow x > |x| \Rightarrow \left\{ \begin{array}{l} x > -x \Rightarrow x > -x \\ x > x \end{array} \right\} D_f = (-2, 2)$

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$$\text{الف) } y = \log_{x-2}^{\omega-x} \rightarrow \begin{cases} \omega-x > 0 \rightarrow \omega > x \\ x-2 > 0 \rightarrow x > 2 \\ x-2 \neq 1 \rightarrow x \neq 3 \end{cases} \quad D_f = (2, \omega) - \{3\}$$

$$\text{ب) } y = \log_{x+2}^{x^2-1} \rightarrow \begin{cases} (x+1)(x-1) > 0 \rightarrow \frac{-1}{+} - \frac{1}{+} \\ x+2 > 0 \Rightarrow x > -2 \\ x+2 \neq 1 \Rightarrow x \neq -3 \end{cases} \quad D_f = (-\infty, -1) \cup (1, \infty) - \{-3\}$$

$$\text{الف) } y = \log_{x-2} \frac{x^2-2x+2}{x-2} \rightarrow \begin{cases} \frac{(x-2)(x-1)}{(x-2)} > 0 \rightarrow \frac{-1}{+} + \frac{+}{+} \\ x \neq 2 \end{cases} \quad D_f = (1, 2) \cup (2, +\infty)$$

$$\text{ب) } y = \log_{x+\omega} \frac{x+2}{x-2} \rightarrow \begin{cases} \frac{x+2}{x-2} > 0 \rightarrow \frac{-}{+} - \frac{+}{+} \\ x-2 \neq 0 \Rightarrow x \neq 2 \\ x+\omega > 0 \Rightarrow x > -\omega \\ x+\omega \neq 1 \Rightarrow x \neq -\omega-1 \end{cases} \quad D_f = (-\omega, -2) \cup (2, +\infty) - \{-\omega-1\}$$

$$\text{الف) } y = \sqrt{2 - \log_2(x-2)} \rightarrow \begin{cases} x-2 > 0 \Rightarrow x > 2 \\ 2 - \log_2(x-2) \geq 0 \Rightarrow 2 \geq \log_2(x-2) \Rightarrow 2^2 \geq x-2 \Rightarrow 4 \geq x-2 \\ \Rightarrow 1. \geq x \end{cases} \quad D_f = (2, 4]$$

$$\text{ب) } y = \log(r \log_r^x - 1) \rightarrow \begin{cases} x > 0 \\ r \log_r^x - 1 > 0 \Rightarrow r \log_r^x > 1 \Rightarrow \log_r^x > \frac{1}{r} \Rightarrow r^{\frac{1}{r}} > x \Rightarrow \sqrt[r]{r} > x \end{cases} \quad D_f = (0, \sqrt[r]{r})$$

$$\text{الف) } y = \frac{r}{r^x+1} \rightarrow \begin{cases} r^x+1 \neq 0 \\ \Rightarrow r^x \neq -1 \rightarrow \text{مستحيل} \\ \Rightarrow D_f = \mathbb{R} \end{cases}$$

$$\text{ب) } y = \frac{r}{r^x-1} \rightarrow \begin{cases} r^x-1 \neq 0 \Rightarrow r^x \neq 1 \\ \Rightarrow x \neq 0 \\ \Rightarrow D_f = \mathbb{R} - \{0\} \end{cases}$$

$$\text{ج) } y = \frac{r}{r^x-2} \rightarrow \begin{cases} r^x-2 \neq 0 \Rightarrow r^x \neq 2 \\ \Rightarrow \log_r^r \neq x \Rightarrow D_f = \mathbb{R} - \{\log_r^r\} \end{cases}$$

$$\text{د) } y = \frac{r}{r^x-2} \rightarrow \begin{cases} r^x-2 \neq 0 \Rightarrow r^x \neq 2 \Rightarrow \log_r^r \neq x \\ \Rightarrow D_f = \mathbb{R} - \{\log_r^r\} \end{cases}$$

$$\text{الف) } y = (2x+1)!$$

$$2x+1 \in \mathbb{W} \Rightarrow 2x \in \mathbb{W}-1 \Rightarrow x \in \frac{\mathbb{W}-1}{2} \Rightarrow D_f = \left\{x \mid x = \frac{k-1}{2}, k \in \mathbb{W}\right\}$$

$$\text{ب) } y = \left(\frac{2x-2}{2x-\omega}\right)! \quad \begin{cases} \frac{2x-2}{2x-\omega} \in \mathbb{W} \Rightarrow 2x-2 = 2x\omega - \omega\omega \Rightarrow 2x-2x\omega = \omega-\omega\omega \\ \Rightarrow x = \frac{\omega-\omega\omega}{2-\omega\omega} \Rightarrow D_f = \left\{x \mid x = \frac{\omega-\omega k}{2-\omega k}, k \in \mathbb{W}\right\} \end{cases}$$