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الف) $y = \frac{\sin x - 2}{2 \cos x + 2}$

$D_f = \mathbb{R} - \left\{ \frac{\pi}{2} + k\pi, \frac{3\pi}{2} + k\pi \right\}$

$2 \cos x + 2 \neq 0$
 $2 \cos x \neq -2 \Rightarrow \cos x \neq -1$
 $\Rightarrow x \neq \pi \Rightarrow D_f = \mathbb{R} - \{\pi\}$

ب) $y = \frac{\sin x + 2}{\cos x - 1}$

$\cos x - 1 \neq 0 \Rightarrow \cos x \neq 1 \Rightarrow x \neq 0, 2\pi$
 $D_f = \mathbb{R} - \{0, 2\pi\}$

الف) $y = \frac{2 \sin x + 1}{\tan x + 1}$

$\cos x \neq 0$

$\tan x + 1 \neq 0 \Rightarrow \tan x \neq -1$

$x \neq \frac{3\pi}{4}, \frac{5\pi}{4} \Rightarrow D_f = \mathbb{R} - \left\{ \frac{3\pi}{4}, \frac{5\pi}{4} \right\}$

ب) $y = \frac{\cos x + 1}{\cot x - 1}$

$\sin x \neq 0$

$\cot x - 1 \neq 0 \Rightarrow \cot x \neq 1$

$x \neq \frac{\pi}{4}, \frac{5\pi}{4} \Rightarrow D_f = \mathbb{R} - \left\{ \frac{\pi}{4}, \frac{5\pi}{4} \right\}$

الف) $\sin y = x^2 - 2$

$D_f = [-\sqrt{3}, -1] \cup [1, \sqrt{3}]$

$D_f = \{x \mid -1 \leq \sin y \leq 1\} \Rightarrow -1 \leq x^2 - 2 \leq 1 \Rightarrow 1 \leq x^2 \leq 3$

ب) $y = \arccos(\sqrt{x} - 3) \Rightarrow -1 \leq \sqrt{x} - 3 \leq 1 \Rightarrow 2 \leq \sqrt{x} \leq 4$

$D_f = 4 \leq x \leq 16$

الف) $\cos y = |x| - 2$

$-1 \leq |x| - 2 \leq 1 \Rightarrow 2 \leq |x| \leq 4$

$D_f = [-4, -2] \cup [2, 4]$

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

$x^2 + 3x + 2 \leq 0 \Rightarrow (x+2)(x+1) \leq 0 \Rightarrow -2 \leq x \leq -1$

$D_f = [-2, -1]$

الف) $y = \log x^2 - 2$

$x^2 - 2 > 0 \Rightarrow x^2 > 2 \Rightarrow x > \sqrt{2}$

$D_f = (x, \infty)$

$D_f = (-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$

ب) $y = \log_r (2 - |x|)$

$D_f = \left(\frac{1}{2}, 2 \right)$

الف) $y = \log_{x-3} (x-1)$

$x-3 > 0 \Rightarrow x > 3$ $Df = x > 3$
 $x-3 \neq 1 \Rightarrow x \neq 4$ $Df = (3, \infty) - \{4\}$

ب) $y = \log_{x+3} (x^2-1)$

$x^2-1 > 0 \Rightarrow x^2 > 1 \Rightarrow x > 1$

$x+3 > 0 \Rightarrow x > -3$ $Df = x > 1$

$x+3 \neq 1 \Rightarrow x \neq -2$ $Df = (-2, 1) \cup (1, +\infty) - \{-2\}$

1,0

الف) $y = \log_{x-3} \frac{x^2-5x+3}{x-3}$

$x-3 \neq 0 \Rightarrow x \neq 3$

$\frac{x^2-5x+3}{x-3} = a(x-3)(x-1)$

$\Rightarrow x \neq 3, 1 = 0$

$\frac{x^2-5x+3}{x-3} > 0 \Rightarrow Df = (1, 3) \cup (3, +\infty)$

$x+0 \neq 1 \Rightarrow x \neq 1$

$x+0 > 0 \Rightarrow x > 0$

ب) $y = \log_{x+3} \frac{x+3}{x-3}$

$\frac{x+3}{x-3} > 0 \Rightarrow x > 3$

$Df = (-\infty, -2) \cup (-2, +\infty)$

الف) $y = \sqrt{x-1} \log_{x-2} (x-1)$

$x-2 \geq 0, x-2 > 0$
 $x > 2$

$Df = 2 < x \leq 1$

$\Rightarrow 2 \geq \log_{x-2} (x-1) \Rightarrow 1 \geq x > 2$

ب) $y = \log_{\sqrt{x}} (x \log_{\sqrt{x}} - 1)$

$x \log_{\sqrt{x}} - 1 > 0 \Rightarrow x \log_{\sqrt{x}} > 1$

$Df = \sqrt{x} < x$

$\Rightarrow \log_{\sqrt{x}} > \frac{1}{x}$

1,0

الف) $y = \frac{x}{x^n+1}$

$x^n+1 \neq 0 \Rightarrow x^n \neq -1 \Rightarrow Df = \mathbb{R}$

ب) $y = \frac{x}{x^n-1}$

$x^n-1 \neq 0 \Rightarrow x^n \neq 1 \Rightarrow Df = \mathbb{R} - \{0\}$

ج) $y = \frac{x}{x^n-2}$

$x^n-2 \neq 0 \Rightarrow x^n \neq 2 \Rightarrow Df = \mathbb{R} - \{\frac{1}{x}\}$

د) $y = \frac{x}{x^n-3}$

$x^n-3 \neq 0 \Rightarrow x^n \neq 3 \Rightarrow Df = \mathbb{R} - \{\log_{\sqrt{x}}\}$

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الف) $y = (x^n+1)!$

$x^n+1 \in \mathbb{N} \Rightarrow x^n \in \mathbb{N}-1$

$\Rightarrow x \in \frac{\mathbb{N}-1}{x}$

ب) $y = (\frac{x^n-1}{x^n-2})!$

$x^n-2 \neq 0 \Rightarrow x^n \neq 2 \Rightarrow x \neq \sqrt[n]{2}$

$\frac{x^n-1}{x^n-2} \in \mathbb{N} \Rightarrow x^n-1 \in x^n \mathbb{N} - 2 \mathbb{N}$

$\Rightarrow x^n \in \frac{x^n \mathbb{N} - 2 \mathbb{N} + 1}{x^n}$

1,0

$Df = \{x | x = \frac{2k-1}{x^n+1}, k \in \mathbb{N}\}$