

$$\text{الف) } y = \frac{x+2}{3x^2 - 2x + 1} = \frac{x+2}{(x-1)(x-\frac{1}{2})(x-\frac{2}{3})} \Rightarrow D_f = \mathbb{R} - \left\{1, \frac{1}{2}, \frac{2}{3}\right\}$$

$$\text{ب) } y = \frac{x+3}{3x^2 - x^2 - 1x - 2} = \frac{x+3}{(x+1)(x-2)(x+\frac{1}{2})} \Rightarrow D_f = \mathbb{R} - \left\{-1, 2, -\frac{1}{2}\right\}$$

$$\text{الف) } y = \frac{x+1}{x - \sqrt{3-2x}} \Rightarrow x \neq \sqrt{3-2x} \Rightarrow x^2 \neq 3-2x$$

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

$$3-2x > 0 \Rightarrow 3 > 2x \Rightarrow \frac{3}{2} > x \Rightarrow D_f = (-\infty, 1) \cup (1, \frac{3}{2}]$$

$$\text{ب) } y = \frac{x+2}{x - \sqrt{3-2x}} \Rightarrow x \neq \sqrt{3-2x} \Rightarrow x^2 \neq 3-2x \Rightarrow x^2 - 2x + 3 \neq 0 \Rightarrow (x-1)(x-2) \neq 0 \Rightarrow x \neq 1, 2 \Rightarrow D_f = \left[\frac{3}{2}, 1\right) \cup (1, 2) \cup (2, +\infty)$$

$$\text{الف) } \sin x \Rightarrow 2(\cos x - 1) \neq 0 \Rightarrow \cos x \neq 1 \Rightarrow \cos x \neq \frac{1}{2}$$

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

$$\text{ب) } y = \frac{\cos x + 1}{2\sin x} \Rightarrow 2\sin x \neq -1 \Rightarrow \sin x \neq -\frac{1}{2} \Rightarrow D_f = \mathbb{R} - \left\{2k\pi - \frac{\pi}{6}, 2k\pi + \frac{7\pi}{6}\right\}$$

$$\text{ج) } y = \frac{\tan x + 1}{\cot x - 1} \Rightarrow \cot x \neq 1 \Rightarrow D_f = \mathbb{R} - \left\{k\pi, k\pi + \frac{\pi}{2}\right\}$$

$$\text{د) } y = \frac{\sin x + 1}{2\sin^2 x} \Rightarrow 2\sin^2 x \neq 0 \Rightarrow \sin^2 x \neq \frac{1}{2} \Rightarrow \sin x \neq \pm \frac{\sqrt{2}}{2} \Rightarrow D_f = \mathbb{R} - \left\{k\pi + \frac{\pi}{4}, k\pi - \frac{\pi}{4}\right\}$$

$$\text{الف) } x^2 - 2x + 4 > 0 \Rightarrow (x-1)(x-2) > 0 \Rightarrow \frac{x}{x-1} > \frac{2}{x-2} \Rightarrow x = (-\infty, 1) \cup (2, +\infty)$$

$$\text{ب) } x^2 - 4x + 5 < 0 \Rightarrow (x-1)(x-5) < 0 \Rightarrow \frac{1}{x-1} > \frac{5}{x-5} \Rightarrow x = (1, 5)$$

$$\text{ج) } x^2 + 4x + 5 > 0 \Rightarrow (x+1)(x+5) > 0 \Rightarrow \frac{-5}{x+1} > \frac{-1}{x+5} \Rightarrow x = (-\infty, -5] \cup [-1, +\infty)$$

$$\text{د) } x^2 - 4x + 4 \leq 0 \Rightarrow (x-1)(x-4) \leq 0 \Rightarrow \frac{1}{x-1} \leq \frac{4}{x-4} \Rightarrow x = [1, 4]$$

$$\text{الف) } \frac{x^2 - 3x + 2}{x-5} < 0 \Rightarrow \frac{1}{x-5} > \frac{3}{x-4} \Rightarrow x = (-\infty, 1) \cup (2, 5)$$

$$\text{ب) } \frac{x^2 - 1}{x^2 - 4x + 4} \geq 0 \Rightarrow \frac{(x+1)(x-1)}{(x-1)(x+2)} \geq 0 \Rightarrow \frac{-1}{x-1} \geq \frac{2}{x+2} \Rightarrow x = (-\infty, -1] \cup (2, +\infty)$$

الف) $y = \sqrt{\frac{a^x - f(a)^x}{a^x - 1}} \Rightarrow \frac{(a-1)(a^x - f(a)^x)}{(a-1)(a^x + a + 1)} \geq 0 \Rightarrow \frac{1}{-f - f + 1} \Rightarrow D_f = [f, +\infty)$

ب) $y = \sqrt{\frac{a^x - f(a)^x + f^x}{a^x - 1}} \Rightarrow a^x - 1 \neq 0 \Rightarrow a^x \neq 1 \Rightarrow a \neq \pm 1 \Rightarrow D_f = \mathbb{R} - \{-1, 1\}$

الف) $y = \log(a^x - f(a)^x) \Rightarrow a^x - f(a)^x > 0 \Rightarrow a^x > f(a)^x \Rightarrow a > f \Rightarrow D_f = (f, +\infty)$

ب) $y = \log \frac{1}{|a| - f} \Rightarrow |y - a^x| > 0 \Rightarrow |y| > a^x \Rightarrow f > a > -f$
 $\Rightarrow |y| = \log \frac{1}{|a| - f} \Rightarrow |a| - f > 0 \Rightarrow |a| - f \neq 1 \Rightarrow (a \neq f \Rightarrow a \neq \pm f)$

$D_f = (-f, -1) \cup (1, f) - \{f, -f\}$ (ب) $|a| > f \Rightarrow a > f \vee a < -f$

ج) $y = \log \left(\frac{a^x - f(a)^x + 1}{a - f} \right) \Rightarrow \frac{a^x - f(a)^x + 1}{a - f} > 0 \Rightarrow a < 1, a \neq f$

$D_f = (f, 1) - \{f\}$ $\frac{a^x - f(a)^x + 1}{a - f} > 0 \Rightarrow (a - f)(a - f) > 0 \Rightarrow a - f > 0 \Rightarrow a > f$
 $\frac{a^x - f(a)^x}{a - f} > 0 \Rightarrow \frac{a^x - f(a)^x}{a - f} > 0 \Rightarrow a^x > f(a)^x \Rightarrow a > f$

د) $y = \sqrt{a^x - 1} + f + \log a \Rightarrow a > 0, a \neq 1$
 $\Rightarrow (a - 1)(a - f) > 0 \Rightarrow \frac{f - 1}{1 - f - f + 1} \Rightarrow a = (-\infty, f] \cup [1, +\infty)$

$D_f = [0, f] - \{1\}$

$y = \frac{a^x - a}{a^x + a}$

a	-	0	1
$a^x - a$	+	+	0 = 0
$a^x + a$	+	0	- 0 + +
f	+	+	- 0 +

$\frac{-1}{+f - f - 1 +}$

$y = \sqrt{\frac{a - f(a)}{f(a)}}$

a	-	1	2	3
$a - f(a)$	-	0	+	+
$f(a)$	+	0	-	+
f	+	+	+	+

$D_f = (-1, 1] \cup (1, 3]$

$\frac{-f}{-f + f - f + f}$

