

الف) $y = \frac{x+3}{x^3 + x^2 - 12x + 12}$

$y = \frac{x+3}{(x+3)(x-1)(x-4)}$

$D = R - \{-3, 1, 4\}$

ب) $y = \frac{x+3}{x^3 + 9x^2 + 10x + 4}$

$y = \frac{x+3}{(x+1)(x+4)(x+2)}$

$D = R - \{-1, -4, -2\}$

ج) $y = \frac{x+3}{x^3 - 12x^2 + 12x - 1}$

$D = R - \{1\}$

د) $y = \sqrt{\frac{x+3}{x^3 - 12x^2 + 12x - 1}}$

$D = [-4, -3] \cup (6, +\infty)$

$y = \frac{2}{x^2 - a|x-1| - 2x + a}$

$D = R - \{-3, 0, 2, a\}$

$x \geq 1 \rightarrow x^2 - a(x-1) - 2x + a = x^2 - 2x + 1 = (x-1)^2$

$x < 1 \rightarrow x^2 - a(1-x) - 2x + a = x^2 - x + a - 2 = (x-1)(x-2) + a - 1$

الف) $y = \frac{x+3}{|x+1| - |x+3|}$

$|x+1| \neq |x+3|$

$x+1 = x+3 \rightarrow x=2$

$x+1 = -(x+3) \rightarrow x=-2$

$D = R - \{-2, 2\}$

ب) $y = \sqrt{|x+1| - |x+3|}$

$|x+1| \geq |x+3|$

$(x+1)^2 \geq (x+3)^2$

$x^2 + 2x + 1 \geq x^2 + 6x + 9$

$-4x \geq 8 \rightarrow x \leq -2$

$D = (-\infty, -2]$

الف) $y = \log_r (1 - \log_r x)$

$1 - \log_r x > 0 \rightarrow \log_r x < 1 \rightarrow x < r$

ب) $y = \log_r (1 - \log_r \frac{x}{r})$

$1 - \log_r \frac{x}{r} > 0 \rightarrow \log_r \frac{x}{r} < 1 \rightarrow \frac{x}{r} < r \rightarrow x < r^2$

$\star \wedge \star \star = (0, 3)$

$\star \wedge \star \star = x < \frac{1}{r}$

$\star \wedge \star \star = x > \frac{1}{r}$

$$f(x) = \sqrt{\log_{\omega} (2x-1)}$$

$$2x-1 > 0 \rightarrow x > \frac{1}{2}$$

$$\log_{\omega} (2x-1) > 0 \rightarrow 2x-1 > 1 \rightarrow x > 1$$

$$\log_{\omega} (2x-1) \geq 0 \rightarrow \log_{\omega} (2x-1) \leq \left(\frac{1}{\omega}\right)^0 \rightarrow \log_{\omega} (2x-1) \leq 1 \rightarrow 2x-1 \leq \omega$$

$$2x \leq \omega + 1 \rightarrow x \leq \frac{\omega + 1}{2}$$

$$x \in \left(\frac{1}{2}, \frac{\omega + 1}{2}\right]$$

6

$$y = \log (2 \cos x + 1)$$

$$\rightarrow 2 \cos x > -1 \rightarrow \cos x > -\frac{1}{2} \rightarrow D = R - \left\{ \frac{2\pi}{3} + 2k\pi, \frac{4\pi}{3} + 2k\pi \right\}$$

$$y = \sqrt{\log \frac{x-1}{x+1}}$$

$$\log \frac{x-1}{x+1} > 0 \rightarrow \frac{x-1}{x+1} > 1 \rightarrow x > 1$$

$$\frac{x-1}{x+1} > 1 \rightarrow x > 1$$

$$x \in (-1, \infty)$$

$$0 < x-1 \leq 1 \rightarrow x > 1$$

7

$$f(x) = \sqrt{(a+1)x^2 + ax + b}$$

$$a = -2 \rightarrow -2x + b > 0$$

$$x=2 \rightarrow -2(2) + b = 0 \rightarrow b = 4$$

8

$$f(x) = \sqrt{x^2 + 2x + 2 - m^2}$$

$$\rightarrow x^2 + 2x + 2 - m^2 \geq 0 \rightarrow \Delta \leq 0 \rightarrow F - 4 + 4m^2 \leq 0$$

$$F - 4 + 4m^2 \leq 0$$

$$m^2 \leq 1$$

$$-1 \leq m \leq 1$$

$$1 - (-1) = 2$$

9

$$f(x) = \frac{\sqrt{F-x^2}}{[x] + [-x] + 1}$$

$$F - x^2 \geq 0 \rightarrow x^2 \leq F \rightarrow -\sqrt{F} \leq x \leq \sqrt{F}$$

$$[x] + [-x] \rightarrow x \in \mathbb{Z} \rightarrow [x] + [-x] = 0 \checkmark$$

$$x \in \mathbb{R} - \mathbb{Z} \rightarrow [x] + [-x] = -1 \cup \mathbb{R}$$

$$x \in D = \left\{ -\sqrt{F}, -1, 0, 1, \sqrt{F} \right\}$$

10