

$$\frac{x^2-4x}{x^2-x} \geq 0 \Rightarrow \frac{x(x-4)}{x(x-1)} \geq 0 \quad \begin{array}{c} -1 \quad 0 \quad 1 \quad 4 \\ - \quad + \quad + \quad - \quad + \\ \underbrace{\quad} \quad \underbrace{\quad} \quad \underbrace{\quad} \quad \underbrace{\quad} \end{array} \quad D = (-1, 1) \cup [4, +\infty)$$

$$\text{ب) } \frac{x^5-x^3}{x^4-x} \geq 0 \Rightarrow \frac{x^3(x^2-1)}{x(x^2-1)} \geq 0 \Rightarrow \frac{-1 \quad 0 \quad 1}{+ \quad + \quad +} \quad D = \mathbb{R} - \{\pm 1, 0\}$$

$$\text{الف) } x + |x| > 0 \quad D = (0, +\infty)$$

$$\begin{cases} x > 0 \Rightarrow |x| = x \Rightarrow 2x > 0 \Rightarrow x > 0 \checkmark \\ x < 0 \Rightarrow |x| = -x \Rightarrow x + (-x) = 0 \times \end{cases}$$

$$\text{ب) } x|x| > 0 \quad D = (0, +\infty)$$

$$\begin{cases} x > 0 \Rightarrow |x| = x \Rightarrow x|x| = x^2 > 0 \checkmark \\ x < 0 \Rightarrow |x| = -x \Rightarrow x|x| = -x^2 < 0 \times \end{cases}$$

$$2 - [x] \geq 0 \Rightarrow 2 \geq [x] \Rightarrow D = (-\infty, 3)$$

$$\text{ب) } 2 - [x] > 0 \Rightarrow 2 > [x] \Rightarrow D = (-\infty, 2)$$

$$\text{الف) } \left[x - \frac{1}{3}\right] + \left[x + \frac{2}{3}\right] \geq 0 \quad \left[x + \frac{2}{3}\right] = \left[x - \frac{1}{3}\right] + 1 \Rightarrow 2\left[x - \frac{1}{3}\right] + 1 \geq 0$$

$$\left[x - \frac{1}{3}\right] \geq 0 \Rightarrow x - \frac{1}{3} \geq 0 \Rightarrow x \geq \frac{1}{3} \Rightarrow D = \left[\frac{1}{3}, +\infty\right)$$

$$\text{ب) } \left[x - \frac{1}{3}\right] + \left[-x + \frac{1}{3}\right] \geq 0$$

$$x - \frac{1}{3} = a \quad [a] + [-a] = \begin{cases} 0 & a \in \mathbb{Z} \checkmark \Rightarrow x - \frac{1}{3} \in \mathbb{Z} \Rightarrow D = \left\{n + \frac{1}{3} \mid n \in \mathbb{Z}\right\} \\ -1 & a \notin \mathbb{Z} \times \end{cases}$$

$$\text{الف) } \sin^{-1} \neq 0 \Rightarrow \sin \neq 1 \Rightarrow D = \mathbb{R} - \left\{2k\pi + \frac{\pi}{2}\right\}$$



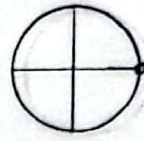
$$\text{ب) } 2\sin^2 x - 1 \neq 0 \Rightarrow \sin^2 x \neq \frac{1}{2} \Rightarrow \sin x \neq \pm \frac{\sqrt{2}}{2} \Rightarrow D = \mathbb{R} - \left\{\frac{k\pi}{4} + \frac{\pi}{4}\right\}$$

الف) $\sin x - 1 \geq 0 \Rightarrow \sin x \geq \frac{1}{1} \Rightarrow D = \left[2k\pi + \frac{\pi}{2}, 2k\pi + \frac{5\pi}{2} \right]$



6

ب) $\cos x - 1 \geq 0 \Rightarrow \cos x \geq 1 \Rightarrow D = \{2k\pi\}$



الف) $-1 \leq |x| - 3 \leq 1 \Rightarrow 2 \leq |x| \leq 4 \Rightarrow D = [-4, -2] \cup [2, 4]$

7

ب) $-1 \leq x^2 + 3x + 1 \leq 1$

$$\begin{cases} -1 \leq x^2 + 3x + 1 \Rightarrow 0 \leq x^2 + 3x + 2 \Rightarrow 0 \leq (x+1)(x+2) \Rightarrow x \leq -2 \text{ or } x \geq -1 \\ x^2 + 3x + 1 \leq 1 \Rightarrow x^2 + 3x \leq 0 \Rightarrow x(x+3) \leq 0 \Rightarrow -3 \leq x \leq 0 \end{cases} \Rightarrow D = [-3, -2] \cup [-1, 0]$$

الف) $2 - \log_3(x-2) \geq 0 \Rightarrow \log_3(x-2) \leq 2 \Rightarrow \begin{cases} x-2 \leq 9 \Rightarrow x \leq 11 \\ x-2 > 0 \Rightarrow x > 2 \end{cases}$

$D = (2, 11]$

ب) $\log(x^2 - x) \quad x^2 - x > 0 \Rightarrow x(x-1) > 0 \Rightarrow x(x-1)(x+1) > 0 \Rightarrow x = 0, \pm 1$

$$\begin{array}{c|ccc} -1 & 0 & 1 & \\ \hline + & - & + & - \\ \hline \end{array} \Rightarrow D = (-\infty, -1) \cup (0, 1)$$

8

الف) $f^x + 1 \neq 0 \Rightarrow f^x \neq -1 \Rightarrow D = \mathbb{R}$

ب) $f^x - 1 \neq 0 \Rightarrow f^x \neq 1 \Rightarrow D = \mathbb{R} - \{0\}$

9

ج) $f^x - 2 \neq 0 \Rightarrow f^x \neq 2 \Rightarrow D = \mathbb{R} - \left\{ \frac{1}{2} \right\}$

د) $f^x - 3 \neq 0 \Rightarrow f^x \neq 3 \Rightarrow \log_f 3 = x \Rightarrow D = \mathbb{R} - \{ \log_f 3 \}$

الف) $f^x + 1 \in W \Rightarrow x = \frac{W-1}{f} \Rightarrow D = \left\{ x \mid x = \frac{k-1}{f}, k \in W \right\}$

ب) $\frac{f^x - 2}{f^x - 1} \in W \Rightarrow f^x - 2 = f^W x - 1 \Rightarrow f^x - f^W x = -1 + 2 \Rightarrow f^x - f^W x = 1$

$x = \frac{-1 + 2}{f - f^W} \Rightarrow D = \left\{ x \mid \frac{\Delta k - 2}{f^k - f} \right\}, k \in W$

10