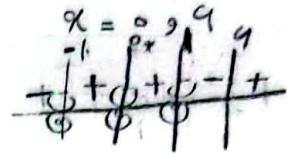


الف) $x^3 - x = 0$ $x(x^2 - 1) = 0$ $x(x-1)(x+1) = 0$ $x \neq 0, 1, -1$

$\frac{x^2 - 4x}{x^3 - x} \geq 0$ $x^2 - 4x \geq 0$ $x(x-4) \geq 0$

$D_f = (-1, 1) \cup [4, +\infty) - \{0\}$

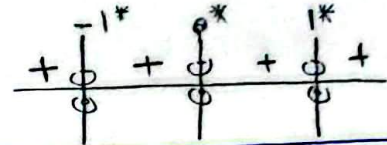


1

ب) $x^3 - x$ $x(x^2 - 1) = 0$ ✓ $x(x-1)(x+1) = 0$ $x \neq 0, 1, -1$

$\frac{x^3 - x^2}{x^3 - x} \geq 0$ $x^3 - x^2 \geq 0$ ^{1, 0} $x^2(x-1) \geq 0$ $x^2(x-1)(x+1) \geq 0$

$D_f = \mathbb{R} - \{1, 0, -1\}$



الف) $x + |x| > 0$ $|x| > -x$ $x < 0 \rightarrow D_f = \text{or } (-\infty, 0)$

ب) $x|x| > 0$ $|x| > 0$ ^{1, 0} ✓ $x \neq 0 \rightarrow D_f = \mathbb{R}^+ \text{ or } x > 0$

2

الف) $y - [x] \geq 0$ $[x] \leq y \rightarrow D_f = (-\infty, y)$

ب) $y - [x] > 0$ $[x] < y \rightarrow D_f = (-\infty, y)$

3

الف) $[x - \frac{1}{p}] + [x + \frac{1}{p}] \geq 0 \rightarrow [x - 1 + \frac{1}{p}] + [x + \frac{1}{p}] \geq 0$
 $\leftarrow [x + \frac{1}{p}] + [x + \frac{1}{p}] - 1 \geq 0$

$y[x + \frac{1}{p}] \geq 1$

$[x + \frac{1}{p}] \geq \frac{1}{p} \rightarrow x + \frac{1}{p} \geq 1 \rightarrow x \geq \frac{p-1}{p} \rightarrow D_f = [\frac{p-1}{p}, +\infty)$

ب) $[x - \frac{1}{p}] + [-x + \frac{1}{p}] \geq 0 \rightarrow [x - \frac{1}{p}] + [-(x - \frac{1}{p})] \geq 0$

$x - \frac{1}{p} \in \mathbb{Z} \rightarrow D_f = \{x | x = k + \frac{1}{p}, k \in \mathbb{Z}\}$

4

الف) $\sin x - 1 = 0$ $\sin x = 1$ $D_f = \mathbb{R} - \{k\pi + \frac{\pi}{2}\}$

ب) $y \sin^2 x - 1 = 0$ $\sin^2 x = \frac{1}{y}$ $\sin x = \pm \frac{1}{\sqrt{y}} \times \frac{\sqrt{y}}{\sqrt{y}} = \pm \frac{\sqrt{y}}{y}$

$D_f = \mathbb{R} - \{\frac{\pi}{2} + \frac{k\pi}{y}\}$

$\sin x \neq \pm \frac{\sqrt{y}}{y}$

$D_f = \mathbb{R} - \{k\pi \pm \frac{\pi}{y}\}$

1, 0

5

الف) $\sin x - 1 \geq 0$ $\sin x \geq \frac{1}{1}$ $D_f = \mathbb{R} - \left\{ -\frac{\sqrt{2}}{4} + \sqrt{2} \frac{\pi}{4} + \sqrt{2} \frac{3\pi}{4} \right\}$ ④

ب) $\cos x - 1 \geq 0$ $\cos x \geq 1$ $D_f = \mathbb{R} - \{ \sqrt{2} \pi \}$

الف) $\cos y = |x| - 3$ $-1 \leq |x| - 3 \leq 1$
 $|x| - 3 \geq -1 \rightarrow |x| \geq 2$
 $|x| - 3 \leq 1 \rightarrow |x| \leq 4$
 $2 \leq |x| \leq 4$
 $x \leq -2$ or $x \geq 2$
 $-4 \leq x \leq 4$
 $D_f = [-4, -2] \cup [2, 4]$ ⑤

ب) $-1 \leq x^2 + 3x + 1 \leq 1$ $\rightarrow x^2 + 3x + 1 \geq -1 \rightarrow x^2 + 3x + 2 \geq 0$
 $(x+1)(x+2) \geq 0$ $x \geq -2$
 $x^2 + 3x + 1 \leq 1$ $x^2 + 3x \leq 0$ $x(x+3) \leq 0 \rightarrow -3 \leq x \leq 0$
 $D_f = [-3, -2] \cup [-1, 0]$ ⑥

الف) $x - 2 \geq 0$ $x \geq 2$ $x - \log_{\mu} (x-2) \geq 0$ $\log_{\mu} (x-2) \leq x$
 $D_f = (2, 11]$ $x \leq 11 \leftarrow x - 2 \leq 9$ ⑦

ب) $x^2 - x \geq 0$ $x(x-1) \geq 0$ $x(x-1)(x+1) \geq 0$
 $(-1, 0) \cup (1, +\infty) = D_f$ ⑧

الف) $K^x + 1 = 0$ $K^x = -1$ $D_f = \mathbb{R}$ ⑨

ب) $K^x - 1 = 0$ $K^x = 1$ $D_f = \mathbb{R} - \{0\}$

ج) $K^x - 2 = 0$ $K^x = 2$ $D_f = \mathbb{R} - \{ \log_K 2 \}$ ⑩

د) $K^x - 3 = 0$ $K^x = 3$ $D_f = \mathbb{R} - \{ \log_K 3 \}$

الف) $(Kx+1)! \rightarrow Kx+1 \in \mathbb{N}$ $Kx \in \mathbb{N} - 1$ $x \in \frac{\mathbb{N}-1}{K}$
 $D_f = \{ x \mid x = \frac{K-1}{K}, K \in \mathbb{N} \}$ ⑪

ب) $\left(\frac{Kx-2}{Kx-3} \right)! \rightarrow \frac{Kx-2}{Kx-3} \in \mathbb{N} \rightarrow Kx-2 = Kx \cdot \mathbb{N} - \mathbb{N}$
 $Kx - Kx \cdot \mathbb{N} = -\mathbb{N} + 2$
 $x(K-2\mathbb{N}) = -\mathbb{N} + 2$
 $x = \frac{-\mathbb{N} + 2}{K-2\mathbb{N}}$
 $D_f = \{ x \mid x = \frac{2-\mathbb{N}}{K-2\mathbb{N}}, K \in \mathbb{N} \}$ ⑫