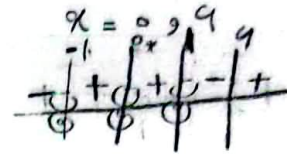


الف) $x^3 - x = 0$ $x(x^2 - 1) = 0$ $x(x-1)(x+1) = 0$ $x \neq 0, 1, -1$

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

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

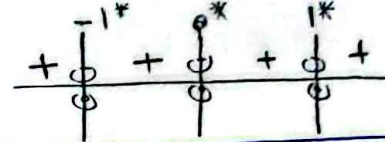


1

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

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

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



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

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

2

الف) $2 - [x] \geq 0$ $[x] \leq 2 \rightarrow D_f = (-\infty, 3)$

ب) $2 - [x] > 0$ $[x] < 2 \rightarrow D_f = (-\infty, 2)$

3

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

$2[x + \frac{1}{x}] \geq 1$

$[x + \frac{1}{x}] \geq \frac{1}{2} \rightarrow x + \frac{1}{x} \geq 1 \rightarrow x \geq \frac{1}{2} \rightarrow D_f = [\frac{1}{2}, +\infty)$

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

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

4

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

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

$D_f = \mathbb{R} - \{\frac{\pi}{4} + \frac{k\pi}{2}\}$

5

الف) $x \sin x - 1 > 0$ $\sin x > \frac{1}{x}$ $D_f = \mathbb{R} - \left\{ -\frac{\sqrt{e}}{4} + \sqrt{e}e, \frac{\sqrt{e}}{4} + \sqrt{e}e \right\}$ ④

ب) $\cos x - 1 > 0$ $\cos x > 1$ $D_f = \mathbb{R} - \{ \sqrt{e}e \}$

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

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

الف) $x - 2 > 0$ $x > 2$ $x - \log_{\mu}^{(x-2)} > 0$ $\log_{\mu}^{(x-2)} \leq \mu$
 $D_f = (2, 11]$ $x \leq 11 \leftarrow x - 2 \leq 9$ ⑥

ب) $x^x - x > 0$ $x(x^x - 1) > 0$ $x(x-1)(x+1) > 0$
 $(-1, 0) \cup (1, +\infty) = D_f$
 $\leftarrow \begin{array}{c} -1 \quad 0 \quad 1 \\ \hline - \quad + \quad - \quad + \end{array}$

الف) $K^x + 1 = 0$ $K^x = -1$ $D_f = \mathbb{R}$ ⑦

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

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

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

الف) $(Kx+1)! \rightarrow Kx+1 \in \mathbb{N}$ $Kx \in \mathbb{N} - 1$ $x \in \frac{\mathbb{N}-1}{K}$
 $D_f = \{ x \mid x = \frac{K-1}{K}, K \in \mathbb{N} \}$ ⑧

ب) $\left(\frac{Kx-\mu}{Kx-\omega} \right)! \rightarrow \frac{Kx-\mu}{Kx-\omega} \in \mathbb{N} \rightarrow Kx-\mu = KxW - \omega W$
 $Kx - KxW = -\omega W + \mu$
 $x(1-KW) = -\omega W + \mu$
 $x = \frac{-\omega W + \mu}{1-KW}$
 $D_f = \{ x \mid x = \frac{\mu - \omega K}{1 - KW}, K \in \mathbb{N} \}$