

الف) $x^3 - x \neq 0 \rightarrow x^3 \neq x \rightarrow x \neq 0, \pm 1$ ۱۹, ۵ $D_f: (-1, 0) \cup (0, 1) \cup (1, +\infty)$

$\frac{x^3 - 9x}{x^3 - x} \geq 0 \rightarrow \frac{x(x^2 - 9)}{x(x^2 - 1)} \geq 0 \rightarrow \frac{x^2 - 9}{x^2 - 1} \geq 0$

ب) $\frac{x^3(x^2 - 1)}{x^3 - x} \geq 0 \rightarrow \frac{x^2(x^2 - 1)}{(x-1)(x+1)} \geq 0$ ۲۰ $D_f: (-\infty, -1) \cup (-1, 0) \cup (0, 1) \cup (1, +\infty)$

الف) $x + |x| \neq 0 \rightarrow |x| \neq -x \rightarrow x \notin \mathbb{R}^+ \cup \{0\}$ $D_f: \mathbb{R}^+ \cup (-\infty, 0)$

$x + |x| \geq 0 \rightarrow |x| \geq -x \rightarrow D: \mathbb{R}$

ب) $x|x| \neq 0 \rightarrow x \neq 0$ ۲۱ $D_f: \mathbb{R}^+ \cup (-\infty, 0)$

$x|x| \geq 0 \rightarrow D = \mathbb{R}^+ \cup \{0\}$

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

ب) $2 - [x] \geq 0 \rightarrow [x] \leq 2 \rightarrow D: (-\infty, 3)$ ۲۲ $D_f = (-\infty, 2)$

$2 - [x] \neq 0 \rightarrow [x] \neq 2 \rightarrow x \notin [2, 3)$
 $(x \in \mathbb{R} - [2, 3))$

الف) $[x - \frac{1}{x}] + [x - \frac{1}{x} + 1] \geq 0 \rightarrow 2[x - \frac{1}{x}] \geq -1 \rightarrow [x - \frac{1}{x}] \geq -\frac{1}{2}$

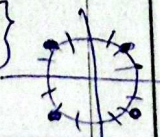
$x - \frac{1}{x} \geq 0 \rightarrow x \geq \frac{1}{x} \rightarrow D_f: [\frac{1}{x}, +\infty)$

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

$\rightarrow D_f: \{x | x = k + \frac{1}{x}, k \in \mathbb{Z}\}$ ۲۳

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

ب) $2 \sin^2 x - 1 \neq 0 \rightarrow 2 \sin^2 x \neq 1 \rightarrow \sin^2 x \neq \frac{1}{2} \rightarrow \sin x \neq \pm \frac{1}{\sqrt{2}}$ ۲۴

$(\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{2}})$ $x \neq \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \rightarrow D_f: \mathbb{R} - \{k\frac{\pi}{2} + \frac{\pi}{4}\}$ 

الف) $r \sin x - 1 \geq 0 \rightarrow r \sin x \geq 1 \rightarrow \sin x \geq \frac{1}{r} \rightarrow \frac{\pi}{9} \leq \sin x \leq \frac{5\pi}{9}$
 $\rightarrow D_f = \left[r\pi + \frac{\pi}{9}, r\pi + \frac{5\pi}{9} \right]$

ب) $\cos x - 1 \geq 0 \rightarrow \cos x \geq 1 \xrightarrow{-1 \leq \cos x \leq 1} \cos x = 1$
 $\rightarrow D_f = \{rk\pi\}$ (ب) ✓

$-1 \leq |x| - r \leq 1 \xrightarrow{+r} r \leq |x| \leq r+1 \rightarrow r \leq x \leq r+1$
 $\rightarrow D_f = [-r, -r] \cup [r, r+1]$

$-1 \leq x^2 + rx + 1 \leq 1 \rightarrow x^2 + rx \leq 0 \rightarrow x(x+r) \leq 0$
 $x^2 + rx + 1 \geq 0 \rightarrow (x+r)(x+1) \geq 0$
 $\rightarrow D_f = (-\infty, -r] \cup [-1, +\infty)$

الف) $x - r > 0 \rightarrow x > r$
 $r - \log_p(x-r) \geq 0 \rightarrow \log_p(x-r) \leq r \rightarrow x-r \leq p^r \rightarrow x \leq 11$
 $r < x \leq 11$

$D_f = (r, 11]$ (ب) ✓
 ب) $x^3 - x > 0 \rightarrow x(x^2 - 1) > 0 \rightarrow x(x-1)(x+1) > 0$
 $\rightarrow D_f = (-1, 0) \cup (1, +\infty)$

الف) $r^x + 1 \neq 0 \rightarrow r^x \neq -1 \rightarrow$ مستحيل $\rightarrow D_f = \mathbb{R}$

ب) $r^x - 1 \neq 0 \rightarrow r^x \neq 1 \rightarrow \log_r 1 \neq x = 0 \rightarrow D_f = \mathbb{R} - \{0\}$

ج) $r^x - r \neq 0 \rightarrow r^x \neq r \rightarrow x \neq \log_r r = 1 \rightarrow D_f = \mathbb{R} - \{1\}$

د) $r^x - r^2 \neq 0 \rightarrow r^x \neq r^2 \rightarrow x \neq \log_r r^2 = 2 \rightarrow D_f = \mathbb{R} - \{2\}$

الف) $r^x + 1 \in W \xrightarrow{-1} r^x \in W-1 \xrightarrow{\div r} x \in \frac{W-1}{r} \rightarrow$

$D_f = \left\{ x \mid x = \frac{k-1}{r}, k \in W \right\}$ (ب) ✓

ب) $\frac{r^x - r}{r^x - r^2} \in W \rightarrow x \in -\frac{-\Delta W + r}{r^x - r^2} = \frac{\Delta W - r}{r^x - r^2}$
 $\rightarrow D_f = \left\{ x \mid x = \frac{\Delta K - r}{r^k - r^2}, k \in W \right\}$