

$$\text{الف) } \frac{x(x-4)}{x(x^2-1)} \geq 0$$

$\rightarrow \pm 1$

$$\begin{array}{cccc} -1 & * & 1 & 4 \\ \hline - & + & + & - & + \end{array}$$

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

19

$$\text{ب) } \frac{x^5 - x^3}{x^3 - x} \geq 0$$

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

$\rightarrow \pm 1$

$$\begin{array}{ccc} * & * & * \\ -1 & 0 & 1 \\ \hline + & + & + & + \end{array}$$

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

الف) $\frac{x+1}{\sqrt{x+|x|}}$

$x + |x| > 0$

- $\oplus$ ✓
- $\ominus$ ✗
- $\odot$ ✗

$D_f = (0, +\infty)$

✓

ب) $\frac{1}{\sqrt{x|x|}}$

$x|x| > 0$

- $\oplus$ ✓
- $\ominus$ ✗
- $\odot$ ✗

$D_f = (0, +\infty)$

$$\text{الف) } 2 - [x] \geq 0 \quad [x] \leq 2 \rightarrow x < 3 \quad D_f = (-\infty, 3)$$

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

(2)

✓

$$\text{الف) } [x - \frac{1}{p}] + [x + \frac{p}{p}] \geq 0 \quad | + [x - \frac{1}{p}] + [x + \frac{p}{p}] \geq 1 \quad D_f = [\frac{1}{p}, +\infty)$$

$$[x + \frac{p}{p}] \geq 1 \quad [x + \frac{p}{p}] \geq \frac{1}{p} \xrightarrow{\text{يك عدد صحيح}} x + \frac{p}{p} \geq 1 \quad x \geq \frac{1}{p} \quad \uparrow$$

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

$$\hookrightarrow [x] + [-x] \begin{cases} x \in \mathbb{Z} & [x] + [-x] = 0 \\ x \notin \mathbb{Z} & [x] + [-x] = -1 \end{cases} \rightarrow x - \frac{1}{p} \in \mathbb{Z} \quad x \in \mathbb{Z} + \frac{1}{p}$$

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

$$\text{الف) } \sin x - 1 \neq 0 \rightarrow \sin x \neq 1$$

$$\sin x \neq 90^\circ \neq \frac{\pi}{2}$$

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

$$\text{ب) } \sqrt{\sin x} - 1 \neq 0$$

$$\sqrt{\sin x} \neq 1$$

$$\sin x \neq \frac{1}{\sqrt{2}}$$

$$\sin x \neq \pm \sqrt{\frac{1}{2}} = \pm \frac{\sqrt{2}}{2} \xrightarrow{\times \sqrt{2}}$$

$$\sin x \neq \pm \frac{\sqrt{2}}{2} \quad D_f = \left\{ k\pi \pm \frac{\pi}{4} \right\}$$

الف) $\frac{x(x-4)}{x(x^2-1)} \geq 0$
 $\rightarrow \pm 1$

$\frac{-1}{-} + \frac{0}{+} + \frac{1}{+} + \frac{4}{+}$

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

ب) $\frac{x^5 - x^3}{x^3 - x} \geq 0$

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

$\frac{-1}{+} + \frac{0}{+} + \frac{1}{+} + \frac{4}{+}$

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

الف) $\frac{x+1}{\sqrt{x+|x|}}$

$x + |x| > 0$
 $\begin{matrix} (+) \checkmark \\ (-) \times \\ (0) \times \end{matrix}$

$D_f = (0, +\infty)$

ب) $\frac{1}{\sqrt{x|x|}}$

$x|x| > 0$
 $\begin{matrix} (+) \checkmark \\ (-) \times \\ (0) \times \end{matrix}$

$D_f = (0, +\infty)$

الف) $2 - [x] \geq 0$

$[x] \leq 2 \rightarrow x < 3$

$D_f = (-\infty, 3)$

ب) $2 - [x] > 0$

$[x] < 2 \rightarrow x < 2$

$D_f = (-\infty, 2)$

الف) $[x - \frac{1}{3}] + [x + \frac{2}{3}] \geq 0$

$1 + [x - \frac{1}{3}] + [x + \frac{2}{3}] \geq 1$ $D_f = [\frac{1}{3}, +\infty)$

$2[x + \frac{2}{3}] \geq 1$

$[x + \frac{2}{3}] \geq \frac{1}{2}$

یک عدد صحیح
 بعد $\frac{1}{2}$

$x + \frac{2}{3} \geq 1 \rightarrow x \geq \frac{1}{3}$

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

$\rightarrow [x] + [-x] \begin{cases} x \in \mathbb{Z} & [x] + [-x] = 0 \rightarrow x - \frac{1}{3} \in \mathbb{Z} \quad x \in \mathbb{Z} + \frac{1}{3} \\ x \notin \mathbb{Z} & [x] + [-x] = -1 \end{cases}$

$D_f = \{x | x = k + \frac{1}{3}, k \in \mathbb{Z}\}$

الف) $\sin x - 1 \neq 0 \rightarrow \sin x \neq 1$

$\sin x \neq 90^\circ = \frac{\pi}{2}$

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

ب) $2\sin^2 x - 1 \neq 0$

$2\sin^2 x \neq 1$

$\sin^2 x \neq \frac{1}{2}$

$\sin x \neq \pm \sqrt{\frac{1}{2}} = \pm \frac{\sqrt{2}}{2} \xrightarrow{\times \sqrt{2}}$

$\sin x \neq \pm \frac{\sqrt{2}}{2} \quad D_f = \{k\pi \pm \frac{\pi}{4}\}$

الف) $2\sin x - 1 \geq 0$ $2\sin x \geq 1$ $\sin x \geq \frac{1}{2}$ $\sin x \geq 30^\circ, 150^\circ$

$D_f = [2k\pi + \frac{\pi}{6}, 2k\pi + \frac{5\pi}{6}]$ (2) ✓

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

بزرگتر از یک وجود ندارد پس مساوی صفر است

الف) $\cos y = |x| - 3 \rightarrow -1 \leq |x| - 3 \leq 1 \quad 2 \leq |x| \leq 4 \quad \begin{cases} 2 \leq x \leq 4 \\ -4 \leq x \leq -2 \end{cases}$

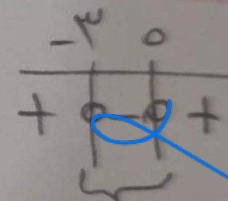
$D_f = [2, 4] \cup [-4, -2]$

ب) $-1 \leq x^2 + 3x + 1 \leq 1 \rightarrow -2 \leq x(x+3) \leq 0$

$-2 \leq x(x+3) \xrightarrow{x=-2} -2(-2+3) = -2$

①

$D_f = [-2, 0] \cup \{-3\}$



$x^2 + 3x + 2 \geq 0 \rightarrow$

$x^2 + 3x \leq 0 \rightarrow$

$D_g = [-3, -2] \cup [-1, 0]$

$$\text{الف) } 2 - \log_3(x-2) \geq 0 \quad \log_3(x-2) \leq 2 \quad (x-2) \leq 3^2 \quad x \leq 11$$

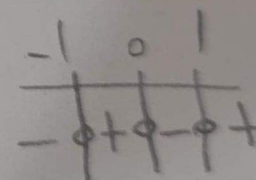
$$x-2 > 0 \quad x > 2 \quad D_f = (2, 11]$$

$$\text{ب) } \log(x^3 - x) \quad x^3 - x > 0 \quad x(x^2 - 1) > 0$$

$$D_f = (-1, 0) \cup (1, +\infty)$$

0 < ±1

Ⓟ ✓



1

الف) $f^x + 1 \neq 0$
 $x \in \mathbb{R} \setminus \{-1\}$

$$D_f = \mathbb{R}$$

(2) ✓

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

ج) $f^x - 2 \neq 0$ $f^x \neq 2$ $\log_f 2 \neq x$ $D_f = \mathbb{R} - \{\log_f 2\}$

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

الف) $x+1 \in W$ $x \in W-1$ $x \in \frac{W-1}{f}$

$$D_f = \{x \mid x = \frac{k-1}{f}, k \in W\}$$

ب) $\frac{fx - 1}{x - \omega} \in W$

$$x = \frac{-\omega W + 1}{fW - f} = \frac{+\omega W - 1}{+fW - f}$$

$$D_f = \{x \mid x = \frac{\omega k - 1}{fk - f}, k \in W\}$$

الف) $2\sin x - 1 \geq 0 \quad 2\sin x \geq 1 \quad \sin x \geq \frac{1}{2} \quad \sin x \geq 30^\circ, 150^\circ$

$D_f = [2k\pi + \frac{\pi}{6}, 2k\pi + \frac{5\pi}{6}]$

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

بزرگتر از یک وجود ندارد پس مساوی صفر است

الف) $\cos y = |x| - 3 \rightarrow -1 \leq |x| - 3 \leq 1 \quad 2 \leq |x| \leq 4 \quad \begin{cases} 2 \leq x \leq 4 \\ -2 \geq x \geq -4 \end{cases}$

$D_f = [2, 4] \cup [-4, -2]$

ب) $-1 \leq x^2 + 3x + 1 \leq 1 \rightarrow -2 \leq x(x+3) \leq 0$

$$\begin{array}{c} -3 \quad 0 \\ + \quad - \quad + \\ \hline + \quad - \quad + \end{array}$$

$-2 \leq x(x+3) \xrightarrow{x=-2} -2(-2+3) = -2$

$D_f = [-2, 0] + \{-3\}$

الف) $2 - \log_3(x-2) \geq 0 \quad \log_3(x-2) \leq 2 \quad (x-2) \leq 3^2 \quad x \leq 11$

$x-2 > 0 \quad x > 2 \quad D_f = (2, 11]$

ب) $\log(x^2 - x) \quad x^2 - x > 0 \quad x(x-1) > 0$

$$\begin{array}{c} -1 \quad 0 \quad 1 \\ - \quad + \quad - \quad + \end{array}$$

$D_f = (-1, 0) \cup (1, +\infty)$

الف) $f^x + 1 \neq 0 \quad D_f = \mathbb{R}$

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

ج) $f^x - 2 \neq 0 \quad f^x \neq 2 \quad \log_2 f^x \neq x \quad D_f = \mathbb{R} - \{\log_2 f^x\}$

د) $f^x - 3 \neq 0 \quad f^x \neq 3 \quad x \neq \log_3 f^x \quad D_f = \mathbb{R} - \{\log_3 f^x\}$

الف) $f_{x+1} \in W \quad f_x \in W-1 \quad x \in \frac{W-1}{f}$

$D_f = \{x | x = \frac{k-1}{f}, k \in W\}$

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

$D_f = \{x | x = \frac{\omega k - 1}{f^k - f}, k \in W\}$