

الف) $\frac{x(x-4)}{x(x-1)(x+1)} \geq 0$

Sign chart: $\begin{array}{c|cccc} & -1 & 0 & 1 & 4 \\ \hline & - & + & + & - \\ \hline \end{array}$

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

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

Sign chart: $\begin{array}{c|ccc} & -1 & 0 & 1 \\ \hline & + & + & + \\ \hline \end{array}$

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

الف) $x + |x| > 0$

$\oplus \checkmark$
 $\ominus \times$
 $\odot \times$

$D_f = (0, +\infty)$

ب) $x|x| > 0$

$\oplus \checkmark$
 $\ominus \times$
 $\odot \times$

$D_f = (0, +\infty)$

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

$[x] \leq 2$

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

$[x] < 2$

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

$[x + \frac{\mu}{\mu}] \geq \frac{1}{2} \xrightarrow{\text{این عبارت صحیح است}} x + \frac{\mu}{\mu} \geq 1 \rightarrow x \geq \frac{1}{\mu} \Rightarrow D_f = [\frac{1}{\mu}, +\infty)$

ب) $[x - \frac{1}{\mu}] + [-(x - \frac{1}{\mu})] \rightarrow x - \frac{1}{\mu} \in \mathbb{Z} \Rightarrow x \in \mathbb{Z} + \frac{1}{\mu}$

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

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

Unit circle diagram showing $\sin x = 1$ at $\frac{\pi}{2}$.

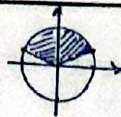
$D_f = \mathbb{R} - \{2k\pi + \frac{\pi}{2}\}$

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

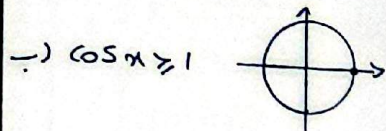
Unit circle diagram showing points where $\sin x = \pm \frac{1}{\sqrt{r}}$.

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

$$1) r \sin x - 1 \geq 0 \rightarrow r \sin x \geq 1 \rightarrow \sin x \geq \frac{1}{r}$$



$$Df = [rK\pi + \frac{\pi}{4}, rK\pi + \frac{3\pi}{4}]$$



$$Df = \{2K\pi\}$$

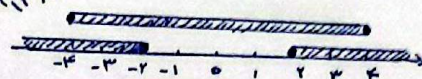
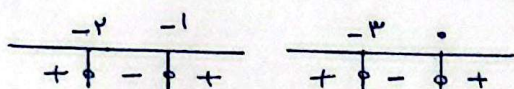
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$$1) -1 \leq |x-3| \leq 1 \rightarrow 2 \leq |x| \leq 4$$

$$|x| \geq 2 \rightarrow x \geq 2 \text{ or } x \leq -2$$

$$|x| \leq 4 \rightarrow -4 \leq x \leq 4$$

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



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$$1) x^2 + 3x + 1 \geq -1 \rightarrow x^2 + 3x + 2 \geq 0 \rightarrow (x+1)(x+2) \geq 0 \rightarrow (-\infty, -2] \cup [-1, +\infty)$$

$$x^2 + 3x + 1 \leq 1 \rightarrow x^2 + 3x \leq 0 \rightarrow x(x+3) \leq 0 \rightarrow [-3, 0] \quad Df = [-3, -2] \cup [-1, 0]$$

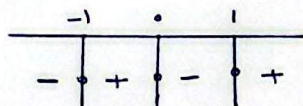
$$2) x-2 > 0 \rightarrow x > 2$$

$$2 - \log_3(x-2) \geq 0 \rightarrow \log_3(x-2) \leq 2 \rightarrow x-2 \leq 9 \rightarrow x \leq 11$$

$$Df = (2, 11]$$

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$$1) x^3 - x > 0 \rightarrow x(x-1)(x+1) > 0$$



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

$$1) Df = \mathbb{R} \quad 2) r^x \neq 1 \rightarrow x \neq 0 \quad Df = \mathbb{R} - \{0\}$$

$$3) r^x \neq r \rightarrow r^x \neq r^1 \quad Df = \mathbb{R} - \{\frac{1}{r}\}$$

$$4) r^x \neq r \rightarrow \log_r r \neq x \quad Df = \mathbb{R} - \{\log_r r\}$$

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$$1) rx + 1 \in \mathbb{W} \rightarrow x \in \frac{\mathbb{W}-1}{r} \quad Df = \{x | x \in \frac{K-1}{r}, K \in \mathbb{W}\}$$

$$2) \frac{rx-1}{rx-2} \in \mathbb{W} \rightarrow x \in -\frac{-\mathbb{W}+1}{rx-2} \quad Df = \{x | x \in \frac{K-1}{rx-2}, K \in \mathbb{W}\}$$

$$= \frac{\mathbb{W}-1}{rx-2}$$

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