

الف)  $\frac{x^2-4x}{x^3-x} \geq 0 \Rightarrow \frac{x(x-4)}{x(x^2-1)} \geq 0 \Rightarrow \frac{x-4}{x^2-1} \geq 0$

ب)  $\frac{x^5-x^3}{x^3-x} \geq 0 \Rightarrow \frac{x^3(x^2-1)}{x(x^2-1)} \geq 0 \Rightarrow x^2 \geq 0$

دیاگرام ۱:  $\frac{x-4}{x^2-1}$

دیاگرام ۲:  $\frac{x^2}{x^2-1}$

$D_f = [2, +\infty) \cup (0, 1) \cup (-1, 0)$

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

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

الف)  $x + |x| > 0$

$x = 0 \Rightarrow x$

$x > 0 \Rightarrow \checkmark$

$x < 0 \Rightarrow x$

$D_f = (0, +\infty)$

ب)  $x|x| > 0$

$x = 0 \Rightarrow x$

$x > 0 \Rightarrow \checkmark$

$x < 0 \Rightarrow x$

$D_f = (0, +\infty)$

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

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

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

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

$D_f = [\frac{1}{3}, +\infty)$

ب)  $[x - \frac{1}{3}] + [-(x - \frac{1}{3})] \geq 0 \Rightarrow x - \frac{1}{3} \in \mathbb{Z} \Rightarrow D_f = \{x | x = k + \frac{1}{3}, k \in \mathbb{Z}\}$

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

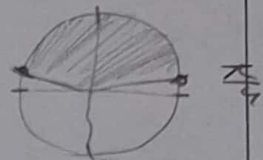
ب)  $2\sin^2 x - 1 \neq 0 \Rightarrow \sin^2 x \neq \frac{1}{2} \Rightarrow \sin x \neq \pm \frac{1}{\sqrt{2}} = \pm \frac{\sqrt{2}}{2}$

$x \neq \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

$D_f = \mathbb{R} - \{k\pi + \frac{\pi}{4}, k\pi + \frac{3\pi}{4}\}$

الف)  $\sqrt{2} \sin x - 1 \geq 0 \quad \sqrt{2} \sin x \geq 1 \quad 1 \leq \sin x \leq \frac{\sqrt{2}}{2}$

$D_f = [\frac{\pi}{4} + 2k\pi, \frac{3\pi}{4} + 2k\pi]$

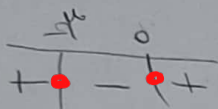


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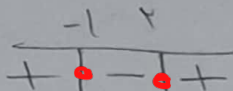
ب)  $\cos x - 1 \geq 0 \quad \cos x \geq 1 \quad \cos x = 1 \quad D_f = 2k\pi$

(2) ✓

الف)  $-1 \leq |x| - 2 \leq 1 \quad 1 \leq |x| \leq 3 \quad D_f = [-3, -1] \cup [1, 3]$



1, 7, 8



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

$x^2 + 3x + 1 \geq -1$   
 $(x+1)(x+2) \rightarrow -2$

$D_f = [-2, -1] \cup [-1, 0]$

الف)  $2 - \log_2(x-2) \geq 0 \quad \log_2 2 - y \leq y \quad x-2 \leq 2 \quad x \leq 4$   
 $x > 2$

$D_f = (2, 4]$

1, 7, 8

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ب)  $x^3 - x > 0$

$x(x^2 - 1) \rightarrow \pm 1$



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

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

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

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ج)  $\epsilon^{x-2} \neq 0 \quad \epsilon^x \neq 2 \quad \log_2 \epsilon^x \neq 2 \quad D_f = \mathbb{R} - \{\log_2 4\}$

د)  $\epsilon^{x-3} \neq 0 \quad \epsilon^x \neq 3 \quad \log_3 \epsilon^x \neq 3 \quad D_f = \mathbb{R} - \{\log_3 27\}$

الف)  $\epsilon^{x+1} \in \mathbb{W} \quad \epsilon^x \in \mathbb{W} - 1 \quad x \in \frac{\mathbb{W}-1}{\epsilon}$

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

(2) ✓

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ب)  $\frac{\epsilon^x - 2}{\epsilon^x - 3} \in \mathbb{W} \quad \epsilon^x - 2 \in \epsilon^x \mathbb{W} - 2\mathbb{W}$   
 $\epsilon^x - 2 \in \mathbb{W} - 2\mathbb{W}$

$x \in \frac{\mathbb{W} - 2}{\epsilon - 2}$

$D_f = \{x | x = \frac{k-2}{\epsilon-2}, k \in \mathbb{W}\}$

$x(\epsilon - 2\mathbb{W}) \in -2\mathbb{W} + 2$