

الف) $y^3 - x = 2x^2 \rightarrow \begin{cases} y_1^3 = 2x^2 + x \\ y_2^3 = 2x^2 + x \end{cases} \rightarrow y_1^3 = y_2^3 \rightarrow y_1 = y_2 \Rightarrow \text{تابع است} \quad (1)$

ب) $|y| + x^2 = x + 2 \rightarrow \begin{cases} |y| = x - x^2 + 2 \\ |y| = x - x^2 + 2 \end{cases} \rightarrow |y_1| = |y_2| \rightarrow y_1 = \pm y_2 \Rightarrow \text{تابع نیست}$

ج) $\sqrt{x-4} + |y-2| = 0 \rightarrow \begin{cases} \sqrt{x-4} = 0 \rightarrow x-4=0 \rightarrow x=4 \\ |y-2| = 0 \rightarrow y-2=0 \rightarrow y=2 \end{cases} \Rightarrow \text{تابع است}$

د) $x = \cos(y) \rightarrow x=0 \Rightarrow y = \{k\pi + \frac{\pi}{2}\} \Rightarrow \text{تابع نیست}$

الف) $y = \frac{x+4}{x^2-4x} \rightarrow D_f = \mathbb{R} - \{0, 4\}$ (2)

ب) $x^2 - 7x + 14 = 0 \rightarrow \Delta = 49 - 56 = -7 < 0 \Rightarrow D_f = \mathbb{R} - \{4, 9\}$

ج) $x^2 + x + 4 \rightarrow \text{تابع است} \Rightarrow D_f = \mathbb{R}$

د) $x^2 - 5x^2 \rightarrow D_f = \mathbb{R} - \{-2, -1, 0, 1, 2\}$

الف) $y = \sqrt{4-x} + \sqrt{x-4} \rightarrow 4 \leq x \leq 4 \rightarrow D_f = [4, 4]$ (3)

ب) $x^2 + 1 \rightarrow \text{تابع است} \Rightarrow D_f = \mathbb{R}$

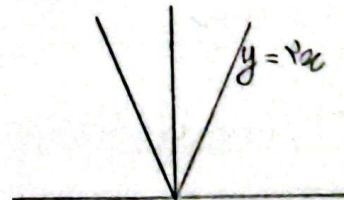
ج) $y = \frac{\sqrt{x-4}}{x-4} \rightarrow \begin{cases} x \geq 4 \\ x \neq 4 \end{cases} \Rightarrow D_f = [4, +\infty)$

د) $|x| + x^2 = 0 \Rightarrow x=0 \Rightarrow D_f = \mathbb{R} - \{0\}$

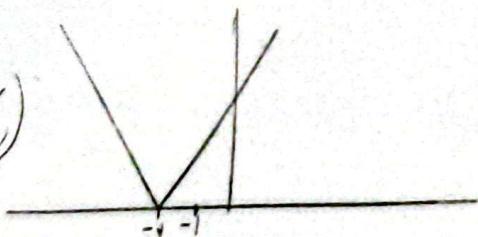
الف)



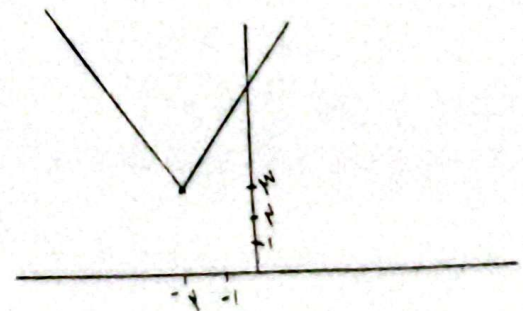
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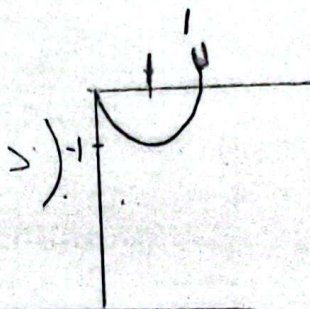
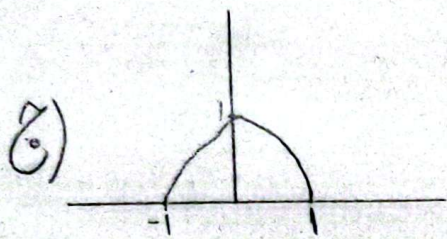
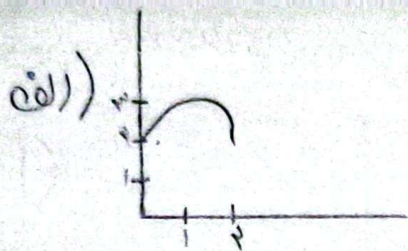


ج)



د)



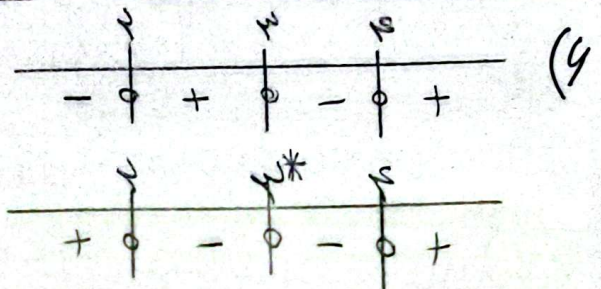


الف) $(x-1)(x-1)(x-1) = 0 \rightarrow x = \{1, 1, 1\}$

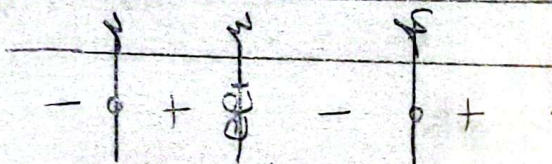
$D_f = [1, +\infty) \cup [1, 1]$

ب) $(x-1)(x-1)^2(x-1) = 0 \rightarrow x = \{1, 1, 1\}$

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

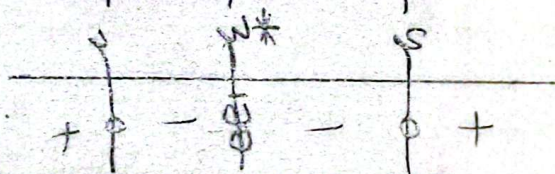


الف)



$\rightarrow D_f = [1, +\infty) \cup [1, 1]$

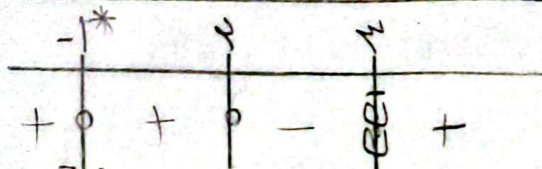
ب)



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

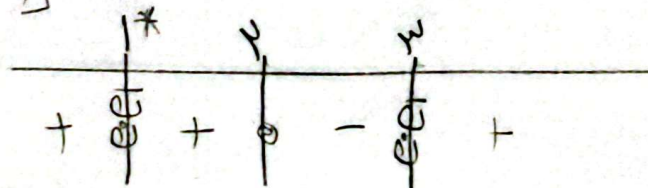
الف) $\frac{(x-1)(x+1)^2}{x-1} \rightarrow$

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



ب) $\frac{(x-1)(x-1)}{(x-1)(x-1)} \rightarrow$

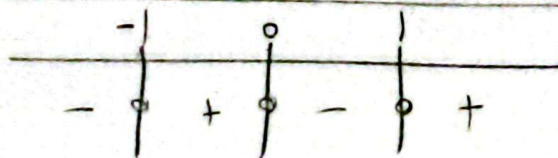
$D_f = (1, +\infty) \cup (1, 1] \cup (-\infty, 1)$



الف) $x^2 - x = 0 \rightarrow x = 0, 1$

$x^2 + x + 1 = 0 \rightarrow \Delta = -3 < 0$

$\Rightarrow D_f = [1, +\infty) \cup [1, 0]$

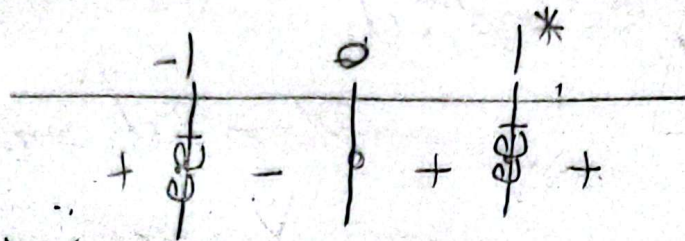


ب) $x^2 + 4x + 4 = 0 \rightarrow \Delta = 0 \Rightarrow x = -2$

$x^2 + 2x + 1 = 0 \rightarrow \Delta = 0 \Rightarrow x = -1$

$\rightarrow D_f = \mathbb{R}$

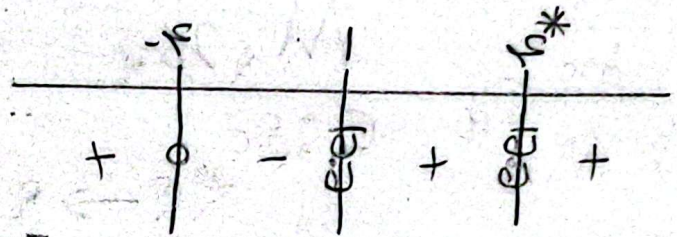
$$Q_1) \frac{x^3 - 1}{x^3 - x} \geq 0 \rightarrow$$



(10)

$$\Rightarrow f_D = (1, +\infty) \cup [0, 1) \cup (-\infty, -1)$$

$$Q_2) \frac{x^3 - 14}{(x-1)(x-4)} \geq 0 \rightarrow$$



$$f_D = (-\infty, -2) \cup (1, 4) \cup (-\infty, -4]$$