

۱۹, ۵

دوازدهم روزه مسابقه ها

مسئله ها

الف) $f(x) = 2 \sin^2(x + \frac{\pi}{4}) - 1$

سوال

$$0 \leq \sin^2(x + \frac{\pi}{4}) \leq 1 \rightarrow 0 \leq 2 \sin^2(x + \frac{\pi}{4}) \leq 2$$

$$\rightarrow -1 \leq 2 \sin^2(x + \frac{\pi}{4}) - 1 \leq 1$$

(۲)

$\rightarrow Rf = [-1, 1]$

ب) $f(x) = 2 \cos^3 - 1 \rightarrow -1 \leq 2 \cos^3 \leq 1$

$$\rightarrow -\frac{1}{2} \leq \cos^3 \leq \frac{1}{2} \rightarrow -\sqrt[3]{\frac{1}{2}} \leq \cos \leq \sqrt[3]{\frac{1}{2}}$$

$\rightarrow [-\sqrt[3]{\frac{1}{2}}, \sqrt[3]{\frac{1}{2}}]$

$y = \frac{x}{|x|} + [x] \quad [-3, 3]$

سوال

(۱, ۷۵)

$[-3, -2] \xrightarrow{[x] = -3} -1 - 3 = -4$

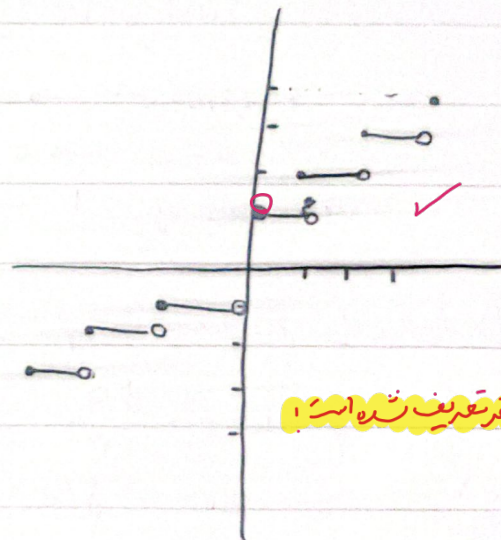
$[-2, -1) \xrightarrow{[x] = -2} -1 - 2 = -3$

$(-1, 0) \xrightarrow{[x] = -1} -1 - 1 = -2$

$[0, 1) \xrightarrow{[x] = 0} 0 + 0 = 0$

$[1, 2) \xrightarrow{[x] = 1} 1 + 1 = 2$

$[2, 3] \xrightarrow{[x] = 2} 2 + 2 = 4$



صفر تعریف شده است

$y = \left| \frac{x+1}{x+3} \right| \rightarrow \frac{x+1}{x+3}$

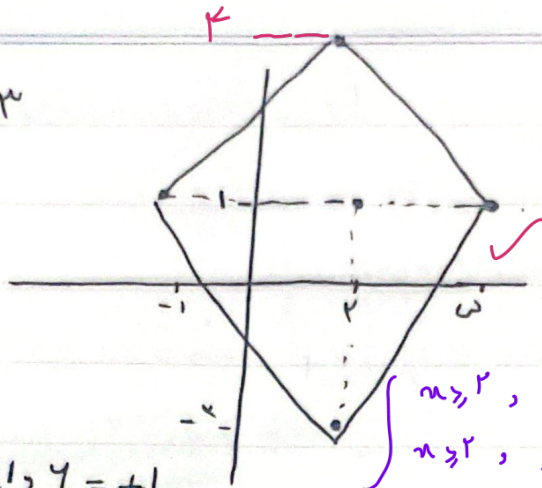
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سوال (۱, ۷۵)

-۳

محل مجانب ها

$$|x-2| + |y-1| = 3$$



سوال ←

(۲) افق

فنا به بنویسید !!

$$\textcircled{1} \quad x+2 = -x+4 \rightarrow x=2, y=1$$

$$\textcircled{2} \quad x+2 = -x \rightarrow x=-1, y=+1$$

$$\textcircled{3} \quad -x = x-4 \rightarrow x=2, y=-2$$

$$\textcircled{4} \quad x-4 = -x+1 \rightarrow x=2.5 \rightarrow x=5, y=1$$

$$\begin{cases} x > 2, y > 1 \rightarrow y = -x+4 \\ x > 2, y < 1 \rightarrow y = x-4 \\ x < 2, y > 1 \rightarrow y = x+2 \\ x < 2, y < 1 \rightarrow y = -x \end{cases}$$

$$\text{الف) } f(x) = x + \frac{1}{x} + x\sqrt{x + \frac{1}{x}}$$

سوال ←

$$x + \frac{1}{x} = a \rightarrow a + 2\sqrt{a} + 1 - 1 \rightarrow (\sqrt{a}+1)^2 - 1 \quad \textcircled{2}$$

$$\rightarrow (\sqrt{a})(\sqrt{a}+2) \xrightarrow{\text{کسر منسوخ}} a = x + \frac{1}{x} \xrightarrow{x=1} 2$$

$$\rightarrow (\sqrt{2})(\sqrt{2}+2) \rightarrow Rf = \sqrt{2} + 2\sqrt{2} + \infty$$

$$\text{ب) } y = (3 - \sin x)(1 + \sin x) \rightarrow -\sin^2 x + 2\sin x + 3$$

$$\begin{cases} \sin x = 1 \rightarrow 2 \\ \sin x = -1 \rightarrow 0 \\ \sin x = \frac{1}{2} = 1 \rightarrow 2 \end{cases}$$

$$Rf = [0, 4]$$

$$f(x) = -\frac{1}{x} + 1$$

$$D = \{2, 3, \dots, 9\}$$

سوال ←

(۲)

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

$$2 \rightarrow -\frac{1}{2} + 1 \rightarrow \frac{1}{2}$$

$$9 \rightarrow -\frac{1}{9} + 1 = \frac{8}{9}$$

$$R = \left\{ \frac{0}{1}, \frac{1}{2}, \dots, \frac{8}{9} \right\}$$

$$\rightarrow \frac{0+1+\dots+8}{9} = \frac{4}{1} = 4$$

$$\rightarrow \sqrt{4} = 2$$

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$$f(x) = \sqrt{ax^2 + bx + c} \quad D = (x_0 + \infty)$$

(2) ← سراسر

$$\hookrightarrow a = 0 \rightsquigarrow bx + c = 0 \xrightarrow{x=2} 2b + c = 0 \rightarrow c = -2b$$

$$\hookrightarrow \sqrt{bx - 2b}$$

$$g(x) = \sqrt{x^2 + 2}$$

$$\begin{aligned} 2b + c &= 0 \\ 2b + c &= 1 \end{aligned} \rightarrow c = -2, b = 1$$

$$-\frac{b}{2a} = 0 - \epsilon$$

$$\sqrt{(x_0 + \infty)} = (x_0 + \infty)$$

$$f(x) = \frac{x^2 - \epsilon x}{x + 2} = \frac{x(x^2 - \epsilon)}{x + 2} = \frac{x(x - \epsilon)(x + 2)}{x + 2}$$

← سراسر

(2)

$$\rightarrow x^2 - \epsilon x$$

$$D = R - \{a, b\} \quad R = [c, +\infty) - \{1\}$$

$$\rightarrow x^2 - \epsilon x = 1 \rightarrow x^2 - \epsilon x - 1 = (x - \epsilon)(x + 2)$$

$$\rightarrow a = \epsilon, b = -2$$

$$[c, +\infty) \rightarrow x^2 - \epsilon x \rightarrow -\frac{b}{2a} = 1 \rightarrow (1)^2 - \epsilon = -1$$

$$c = -1 \rightarrow f\left(\frac{\epsilon - x}{-2}\right) = f(-1) = (-1)^2 - 2(-1) = 3$$

$$y = \sqrt{x^2 + ax^2 + bx} - 1$$

$$\begin{aligned} a &= -2 \\ b &= 1 \end{aligned}$$

$$\rightarrow \sqrt{(x - 2)^2}$$

← سراسر

(2)

$$D = [4, 12]$$

$$\rightarrow R_f = [-1, 1]$$

$$y = [x] + \left[x + \frac{1}{x}\right] \quad \left(\frac{1}{x} \in \mathbb{Z}\right)$$

$$\left(\frac{1}{x} \in \mathbb{Z}\right) \xrightarrow{[x] = 0, \left[x + \frac{1}{x}\right] = 1} 0 + 1 = 1$$

$$\left(1 \in \mathbb{Z}\right) \xrightarrow{[x] = 1, \left[x + \frac{1}{x}\right] = 1} 1 + 1 = 2$$

$$\left(\frac{4}{x} \in \mathbb{Z}\right) \xrightarrow{[x] = 1, \left[x + \frac{1}{x}\right] = 2} 1 + 1 = 2$$

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