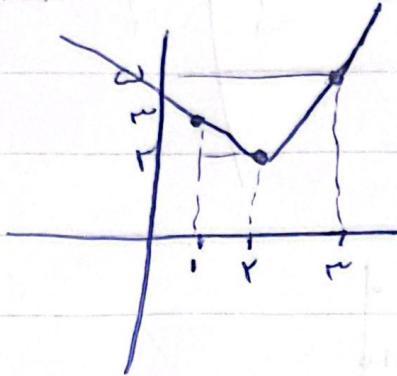


عس فامرس

19, 20

سوال 1.5 ←

الف) $y = x + |2x - 1|$



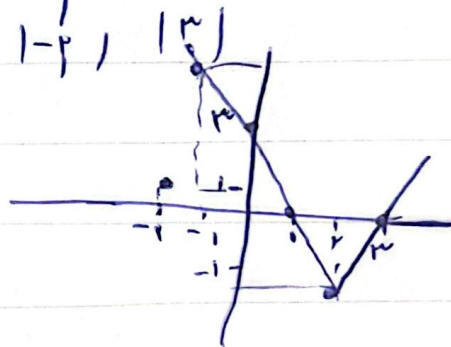
$x + 1 - 2x$ $\rightarrow 1 - x$	$x + 2x - 1 = 3x - 1$
-------------------------------------	-----------------------

$R = [1, +\infty)$

ب) $y = |x - 2| + |x - 1| - |x|$

$-x + 2$	$-x + 1$	$1 - x$	$x - 2$
$[-1, 2]$	$[0, 1]$	$[1, 2]$	$[2, +\infty)$

$R = [-1, +\infty)$

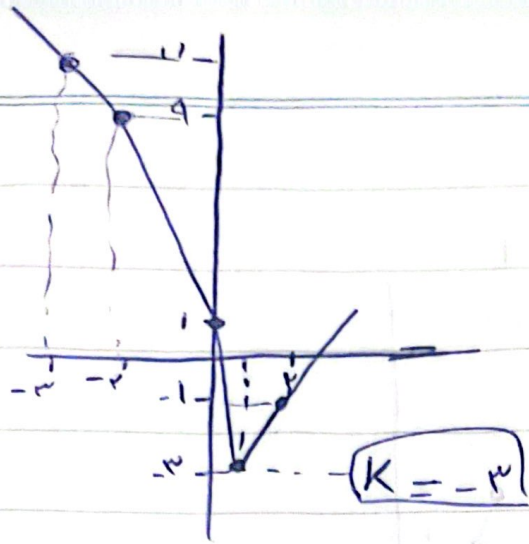


$|x - 2| - |x + 2| = k$

سوال 2 ←

$-x + 2$	$-x + 1$	$2x - 2$
$[-2, 1]$	$[1, 2]$	$[2, +\infty)$

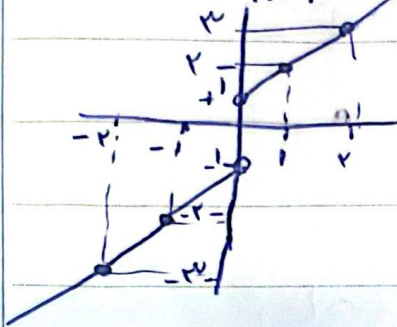
2



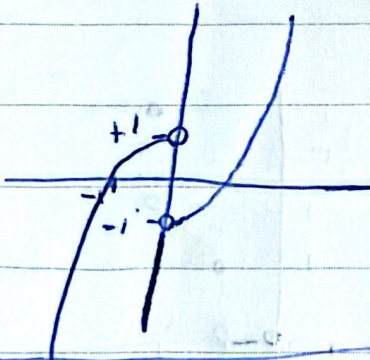
ا) $x + \frac{x}{|x|}$
 $x > 0 \rightarrow x + 1$
 $x < 0 \rightarrow x - 1$

سوال 3 ←

5



ب) $x/|x| - \frac{x}{|x|}$
 $x > 0 \rightarrow x^2 - 1$
 $x < 0 \rightarrow -x^2 + 1$



$[-2, 2]$

سوال 4 ←

ا) $y = [x] - 2x$

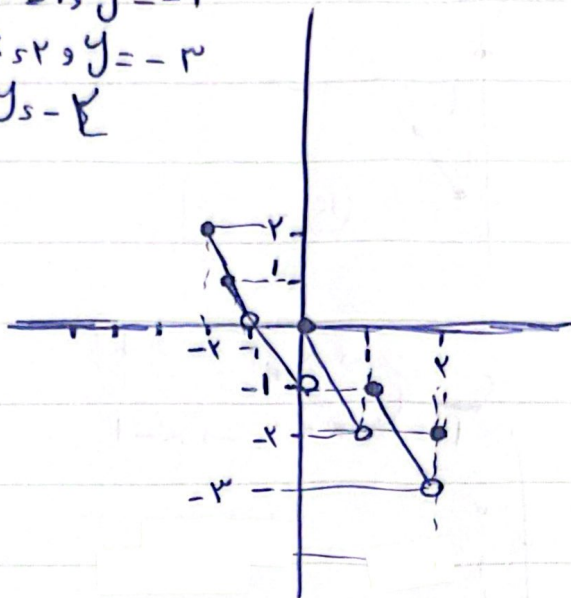
① $-2 \leq x < -1 \rightarrow -2 - 2x$
 $x = -2 \rightarrow y = 2$
 $x = -1 \rightarrow y = 0$

② $-1 \leq x < 0 \rightarrow -1 - 2x$
 $x = -1 \rightarrow y = 1$
 $x = 0 \rightarrow y = -1$

5

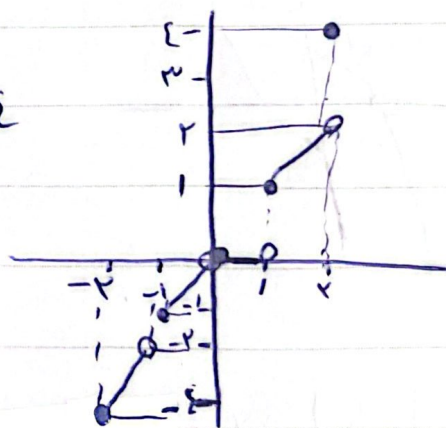
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- (3) $0 < x < 1 \rightarrow -x$ $\begin{cases} x=0, y=0 \\ x=1, y=-1 \end{cases}$
 (4) $1 < x < 2 \rightarrow 1-x$ $\begin{cases} x=1, y=-1 \\ x=2, y=-2 \end{cases}$
 (5) $x > 2 \rightarrow x-2$ $\begin{cases} x=2, y=-2 \\ x=3, y=-3 \end{cases}$



ب) $y = [x]/|x|$

- (1) $-2 < x < -1 \rightarrow -2|x|$ $\begin{cases} x=-2, y=-4 \\ x=-1, y=-2 \end{cases}$
 (2) $-1 < x < 0 \rightarrow -1|x|$ $\begin{cases} x=-1, y=-1 \\ x=0, y=0 \end{cases}$
 (3) $0 < x < 1 \rightarrow$ صفر $(1,0)$
 (4) $1 < x < 2 \rightarrow |x|$ $\begin{cases} x=1, y=1 \\ x=2, y=2 \end{cases}$
 (5) $x > 2 \rightarrow x-2$ $\begin{cases} x=2, y=0 \\ x=3, y=1 \end{cases}$



$y = [x] - [x] \rightarrow 0 \leq [x] - [x] < 1$
 $\rightarrow R_{[x]}([x])$

سوال ٥ ←

$$y = \{x\} - \{x\} \rightarrow 0 \leq \{x\} - \{x\} < 1 \xrightarrow{x \in \mathbb{R}} 0 \leq \{x\} < 1$$

$$\rightarrow \text{Rf} \in [0, 1)$$

$$y = x - \omega \left[\frac{x}{\omega} \right] \xrightarrow{\div \omega} \frac{x}{\omega} - \left[\frac{x}{\omega} \right] \rightarrow 0 \leq \frac{x}{\omega} - \left[\frac{x}{\omega} \right] < 1 \xrightarrow{x \in \mathbb{R}} 0 \leq \frac{x}{\omega} - \left[\frac{x}{\omega} \right] < 1$$

$$\rightarrow \text{Rf} \in [0, 1)$$

$$y = \{x\} - x \rightarrow \{x\} - x \leq 0 \rightarrow \text{Rf} = (-1, 0]$$

$$y = 3 \sin x + 4 \cos x \rightarrow -\sqrt{a^2+b^2} \leq a \sin x + b \cos x \leq \sqrt{a^2+b^2} \leftarrow \text{سوال 4}$$

$$\rightarrow -\sqrt{13} \leq 3 \sin x + 4 \cos x \leq \sqrt{13}$$

$$y = \{ \sin x - 2 \cos x \} \rightarrow -\sqrt{a^2+b^2} \leq a \sin x - b \cos x \leq \sqrt{a^2+b^2}$$

$$\rightarrow -1 \leq \sin x - 2 \cos x \leq 1 \rightarrow \text{Rf} = [-1, 1]$$

$$y = \{ 2 \sin x + 3 \cos x \} \rightarrow -\sqrt{13} \leq 2 \sin x + 3 \cos x \leq \sqrt{13}$$

$$\rightarrow -\sqrt{13} \leq 2 \sin x + 3 \cos x \leq \sqrt{13}$$

$$\rightarrow -4 \leq 2 \sin x + 3 \cos x \leq 4 \rightarrow \{4, -4, -5, -3, -1, 0, 1, 3, 5\}$$

$$y = \sqrt{\cos x - 2 \sin x} \rightarrow -\sqrt{5} \leq \cos x - 2 \sin x \leq \sqrt{5}$$

$$\rightarrow 0 \leq \sqrt{\cos x - 2 \sin x} \leq \sqrt{5} \rightarrow \text{Rf} \in [0, \sqrt{5}]$$

$$\text{مثال 1) } y = \sin^2 x + 3 \sin x + 2 \left\{ \begin{array}{l} \sin x = -1 \\ \sin x = +1 \\ \sin x = -\frac{b}{2a} = -\frac{3}{2} \end{array} \right. \leftarrow \text{سوال 7}$$

$$-1 \rightarrow 1 - 3 + 2 = 0 \rightarrow \text{Rf} \in [0, 4]$$

$$+1 \rightarrow 1 + 3 + 2 = 6$$

$$\text{مثال 2) } y = 2 \sin^2 x + 3 \sin x + 2 \left\{ \begin{array}{l} \sin x = -1 \rightarrow 2 - 3 + 2 = 1 \\ \sin x = +1 \rightarrow 2 + 3 + 2 = 7 \\ \sin x = -\frac{b}{2a} \rightarrow -\frac{3}{4} \rightarrow \frac{9}{8} - \frac{9}{8} + 2 = 2 \end{array} \right.$$

$$\rightarrow \text{Rf} = \left[\frac{1}{2}, 7 \right]$$

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$$\sin^2 x + 1 - \cos^2 x$$

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$$y = \sin^2 x + \cos^2 x \xrightarrow{\star} 1 - \cos^2 x + \cos^2 x$$

سوال ←

$$\rightarrow y = 1 + \underbrace{\cos^2 x}_{[0,1]} \rightarrow \bullet \rightarrow Rf = [1, 2]$$

5

$$ج) y = \frac{\cos^2 x}{1 + \cos^2 x} \rightarrow \frac{\cos^2 x}{\frac{1}{\sin^2 x}} = \frac{\cos^2 x \sin^2 x}{\frac{1}{\sin^2 x}} = \frac{\cos^2 x \sin^4 x}{\sin^2 x}$$

$$\rightarrow \cos^2 x \sin^2 x = \sin^2 x \rightarrow \underbrace{[0, 1]}_3$$

$$y = \sin^4 x + \cos^4 x \rightarrow y^{1/4} \leq \sin^2 x + \cos^2 x \leq 1 \leftarrow \text{سوال}$$

$$\rightarrow y^{1/4} \leq 1 \rightarrow y \leq 1 \rightarrow \frac{1}{4} \leq \sin^4 x + \cos^4 x \leq 1$$

$$\rightarrow Rf = [\frac{1}{4}, 1]$$

$$ج) y = [\sin^4 x + \cos^4 x] \rightarrow y^{1/4} \leq \sin^2 x + \cos^2 x \leq 1$$

$$\rightarrow \frac{1}{4} \leq \sin^4 x + \cos^4 x \leq 1 \rightarrow \underbrace{[0, 1]}_3$$

5

$$\text{انذ) } \frac{y^2 + yx - 1}{x + 1} \quad \frac{y^2 + yx - 1}{-y^2 + yx} \quad \frac{y + 1}{y - 1} \leftarrow \text{سوال}$$

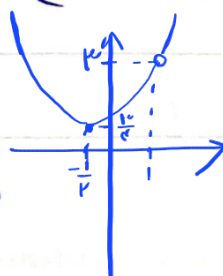
1, 0

$$\rightarrow yx - 1 \rightarrow y(x - 1) - 1 \rightarrow y(x - 1) - 1 = 0 \rightarrow Rf = R - \{-1\}$$

$$ج) \frac{x^3 - 1}{x - 1} \rightarrow \frac{(x - 1)(x^2 + x + 1)}{(x - 1)} = x^2 + x + 1$$

$$\rightarrow \frac{b}{a} = -\frac{1}{1} \Rightarrow \frac{1}{1} - \frac{1}{1} + 1 \rightarrow \frac{1}{1} \Rightarrow x \neq 1 \rightarrow 1 + 1 + 1 = 3$$

$$\rightarrow \left[\frac{1}{1}, +\infty \right) = \{1\}$$



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