

$$\frac{1}{x-1} = |x-1| \xrightarrow{x>1} \frac{1}{x-1} = x-1 \rightarrow x^2 - 2x + 1 = 1 \rightarrow x(x-2) = 0 \rightarrow \begin{cases} x=2 \\ x=0 \end{cases} \quad (1)$$

$$\xrightarrow{x<1} \frac{1}{x-1} = 1-x \rightarrow -x^2 + 2x - 1 = 1 \rightarrow x^2 - 2x + 2 = 0 \rightarrow \Delta < 0 \Rightarrow \text{ریشه ندارد} \quad (2)$$

(الف) $\left| \frac{2x-1}{x} \right| < 2 \rightarrow -2 < \frac{2x-1}{x} < 2 \xrightarrow{(1)} \frac{2x-1-2x}{x} < 0 \rightarrow -\frac{1}{x} < 0 \rightarrow x > 0$ (1)

$\xrightarrow{(2)} \frac{2x-1+2x}{x} > 0 \xrightarrow{\text{مخرج}} \frac{4x-1}{x} > 0 \Rightarrow x > \frac{1}{4}$ (2)

نتیجه: $x \in (\frac{1}{4}, +\infty)$ (1, 2)

(ب) $\left| \frac{x-2}{2x+1} \right| > 1 \xrightarrow{(1)} \frac{x-2}{2x+1} > 1 \rightarrow \frac{x-2-2x-1}{2x+1} > 0 \rightarrow \frac{-x-3}{2x+1} > 0$

$\xrightarrow{(2)} \frac{x-2}{2x+1} < -1 \rightarrow \frac{x-2+2x+1}{2x+1} < 0 \rightarrow \frac{3x-1}{2x+1} < 0$

نتیجه: $x \in (-\frac{1}{2}, \frac{1}{3})$ (1, 2)

$x^2 < |x+9| \xrightarrow{(1)} x^2 < x+9 \Rightarrow x^2 - x - 9 < 0 \Rightarrow (x-3)(x+2) = 0 \Rightarrow x \in (-2, 3)$ (1)

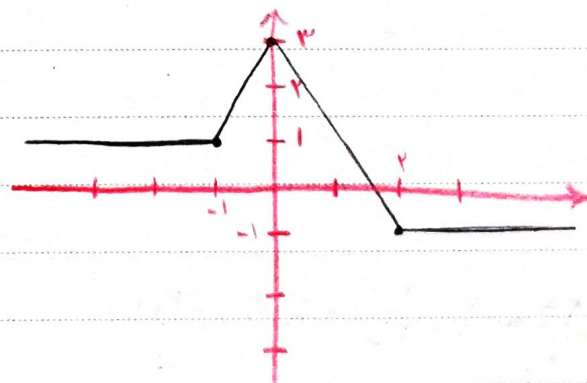
$\xrightarrow{(2)} x^2 < x+9 \Rightarrow x^2 + x + 9 > 0 \rightarrow \Delta < 0 \rightarrow \text{ریشه ندارد} \Rightarrow x \in (-2, 3)$ (2)

$|x-\alpha| < \beta \rightarrow -\beta < x-\alpha < \beta \xrightarrow{+\alpha} \alpha-\beta < x < \alpha+\beta \rightarrow -2 < x < 3$

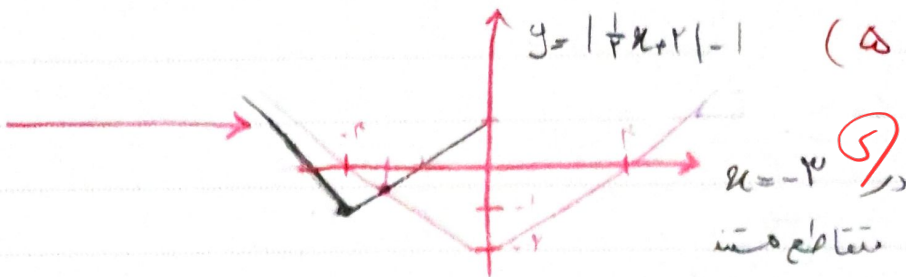
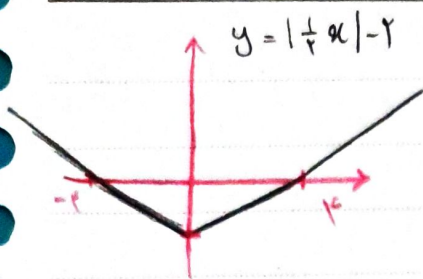
$\begin{cases} \alpha-\beta = -2 \\ \alpha+\beta = 3 \end{cases} \Rightarrow \begin{cases} \alpha = \frac{1}{2} \\ \beta = \frac{5}{2} \end{cases}$

$y = |x+1| - |2x| + |x-2|$ (1)

	-1	0	2
$-x-1+2x-x$	$x+1+2x-x$	$x+1-2x-x$	$x+1-2x+x-2$
	$+2$	$+2$	
$y=1$	$2x+3$	$-2x+3$	-1
x			



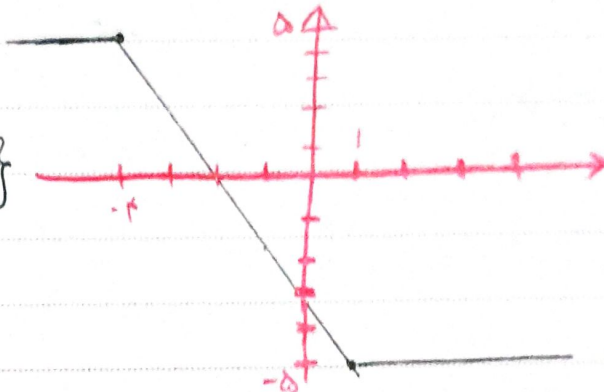
$y_{\max} + y_{\min} = -1 + 3 = 2$ (2)



(الف) $f(x) = [|1-x| - |x+4|]$

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ب. $R_f = \{ \pm 5, \pm 4, \pm 3, \pm 2, \pm 1, 0 \}$



(6)

(5)

ب. $f(x) = \frac{1}{x} - \left[\frac{x+1}{x} \right] \rightarrow \frac{1}{x} - 1 - \left[\frac{1}{x} \right] \Rightarrow 0 \leq \frac{1}{x} - \left[\frac{1}{x} \right] < 1$

$-1 \leq \frac{1}{x} - \left[\frac{1}{x} \right] - 1 < 0 \rightarrow R_f = [-1, 0)$

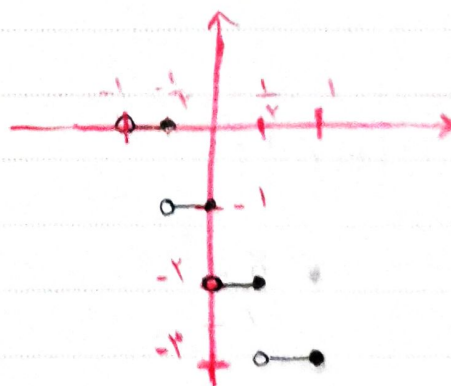
(الف) $y = [-2x] - 1, x \in (-1, 1)$

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

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

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

$\frac{1}{2} < x < 1 \rightarrow y = -3$



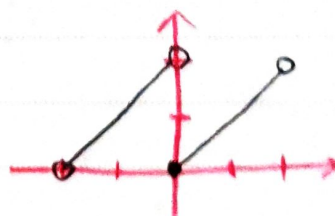
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(5)

ب. $y = x - 2 \left[\frac{x}{2} \right], x \in (-2, 2)$

$-2 < x < 0 \rightarrow y = x + 2$

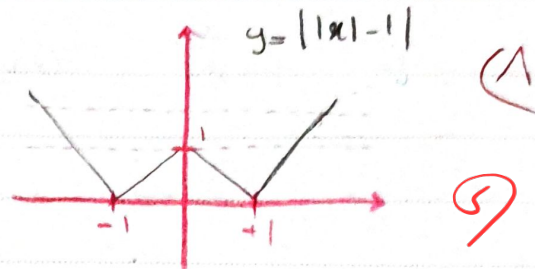
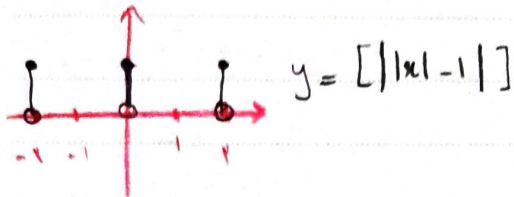
$0 \leq x < 2 \rightarrow y = x$



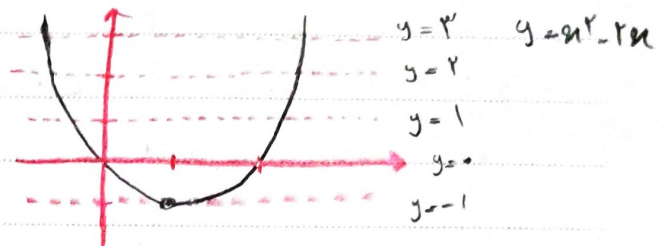
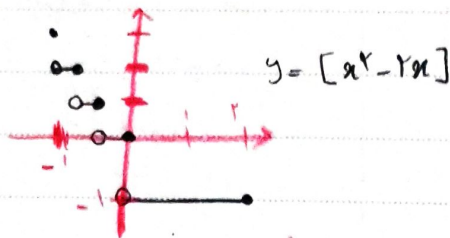
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الف) $y = [|x| - 1]$, $x \in [-2, 2]$



ب) $y = [x^2 - 2x]$, $x \in [-1, 2]$



$a + [b] = 1, 2 \rightarrow [a] = x \rightarrow a = x + 0, 1 \rightarrow x + 0, 1 + y = 1, 2$ (4)

$b - [a] = 2, 1 \rightarrow [b] = y \rightarrow b = y + 0, 1 \rightarrow y + 0, 1 - x = 2, 1$ (5)

$\rightarrow x + y = 1$
 $y - x = 1 \rightarrow 2y = 2 \rightarrow y = 1$, $x = 0 \Rightarrow b = 1, 1$, $a = 0, 1 \rightarrow a + b = 1, 2$

$1 - \sqrt{2} < 0 \rightarrow (1 - \sqrt{2})^y > 0 \rightarrow (1 + \sqrt{2})^y = 19\lambda - (1 - \sqrt{2})^y$ (10)

$\rightarrow -1 < 1 - \sqrt{2} < 0 \rightarrow -1 < (1 - \sqrt{2})^y < 0 \rightarrow 19\lambda - 1 < (1 + \sqrt{2})^y < 19\lambda - 0$ (5)

$19\lambda < (1 + \sqrt{2})^y < 19\lambda \rightarrow [(1 + \sqrt{2})^y] = 19\lambda$