

ا)  $r \sin x + r \cos x = y \Rightarrow -\sqrt{a^2+b^2} \leq a \sin x + b \cos x \leq \sqrt{a^2+b^2} \Rightarrow B_{\text{مركزه}} - \text{نقطه}$

$\hookrightarrow -\sqrt{9+4} \leq r \sin x + r \cos x \leq \sqrt{9+4} \Rightarrow R_y = [-\sqrt{13}, \sqrt{13}]$

ب)  $y = r \sin x - r \cos x \Rightarrow -\sqrt{r^2+r^2} \leq r \sin x - r \cos x \leq \sqrt{r^2+r^2} \Rightarrow R_y = [-\sqrt{2}, \sqrt{2}]$

ج)  $y = [r \sin x + \omega \cos x] \Rightarrow -\sqrt{r^2+\omega^2} \leq r \sin x + \omega \cos x \leq \sqrt{r^2+\omega^2} \Rightarrow [-\sqrt{r^2+\omega^2}, \sqrt{r^2+\omega^2}] \Rightarrow R_y = [-\sqrt{r^2+\omega^2}, \sqrt{r^2+\omega^2}]$

د)  $y = \sqrt{\cos x - r \sin x} \Rightarrow -\sqrt{r^2+1} \leq \cos x - r \sin x \leq \sqrt{r^2+1} \Rightarrow \sqrt{[-\sqrt{r^2+1}, \sqrt{r^2+1}]} \Rightarrow R_y = [0, \sqrt{r^2+1}]$

ا)  $y = \sin^2 x + r \sin x + r \Rightarrow R_y = [-\frac{r}{4}, 1]$

$-\frac{b}{4a} = -\frac{r}{4} \Rightarrow \min \Rightarrow f(-\frac{r}{4}) = -\frac{r^2}{4}$

ب)  $r \sin^2 x + r \sin x + r \Rightarrow R_y = [\frac{r}{4}, 1]$

$-\frac{b}{4a} = -\frac{r}{4} \Rightarrow f(-\frac{r}{4}) = \frac{r}{4}$

ا)  $y = \sin^2 x + r \cos^2 x = r \cos^2 x + (1 - \cos^2 x) = r \cos^2 x + 1 \Rightarrow R_y = [1, r]$

$y = \frac{r \cot^2 x}{1 + \cot^2 x} = \frac{r \cos^2 x}{\sin^2 x} \times \sin^2 x = r \sin^2 x \cos^2 x = \sin^2 2x \Rightarrow R_y = [0, 1]$

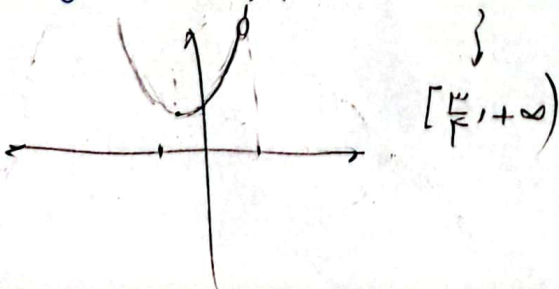
ا)  $\sin^2 x + \cos^2 x = y \Rightarrow r^{1-k} \leq \sin^2 x + \cos^2 x \leq 1 \Rightarrow r^{1-k} \leq \sin^2 x + \cos^2 x \leq 1$

$\Rightarrow r^{1-k} \leq \sin^2 x + \cos^2 x \leq 1 \Rightarrow R_y = [r^{1-k}, 1]$

ب)  $y = [\sin^2 x + \cos^2 x] \Rightarrow [r^{1-k} \leq \sin^2 x + \cos^2 x \leq 1] \Rightarrow R_y = [r^{1-k}, 1]$

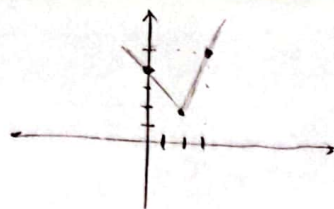
ا)  $y = \frac{r^2 + \lambda r - k}{\lambda + k} \Rightarrow \frac{(r-1)(\lambda+k)}{\lambda+k} = r-1 \Rightarrow R_y = [r-1, r-1]$

ب)  $\frac{x^r-1}{x-1} = y \Rightarrow \frac{(x^r-1)(\lambda-1)}{\lambda-1} = \lambda^r + \lambda + 1 \Rightarrow R_y = [\lambda^r + \lambda + 1, \lambda^r + \lambda + 1]$



$$\omega) y = x + |x-4|$$

$$\begin{array}{c|c|c} -x+4 & x & x-4 \\ \hline | & \circ & | \\ 4 & 4 & 4 \end{array}$$



(A, 5)

باز هم دفتر B

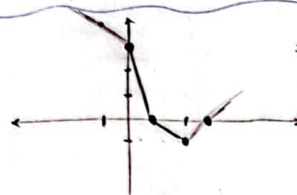
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$$\Rightarrow R_y = [4, +\infty)$$

مسئله 5

$$\omega) y = |x-2| + |x-1| - |x|$$

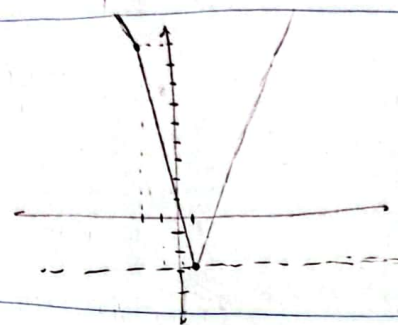
$$\begin{array}{c|c|c|c|c} -x+2 & -x+1 & -x & x-2 & x-1 \\ \hline | & \circ & | & | & | \\ 2 & 1 & 0 & 2 & 1 \end{array}$$



$$\Rightarrow R_y = [-1, +\infty)$$

$$|x-2| - |x+1| = k$$

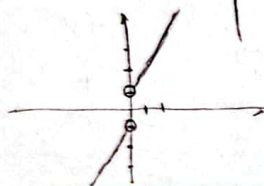
$$\begin{array}{c|c|c} -x+2 & x & x+1 \\ \hline | & \circ & | \\ 2 & 1 & 1 \end{array}$$



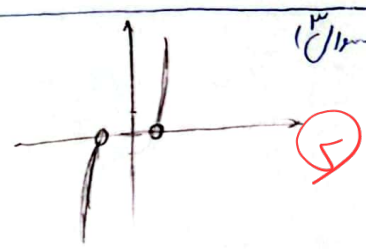
$$\Rightarrow x=1 \rightarrow |x-2| - |x+1| = \boxed{-3} = k$$

مسئله 5

$$\omega) y = x + \frac{x}{|x|} \begin{cases} x+1 : x > 0 \\ x-1 : x < 0 \end{cases}$$



$$\omega) x|x| - \frac{x}{|x|} = \begin{cases} x^2-1 & x > 0 \\ -x^2+1 & x < 0 \end{cases}$$



مسئله 5

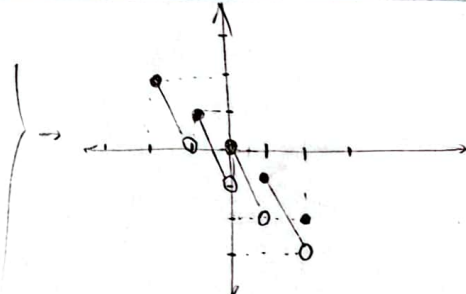
$$\omega) y = [x] - 2x \Rightarrow \Delta y = f(x) \rightarrow y = -x$$

$$\Delta y = [1, 2) \rightarrow y = -2x+1$$

$$\Delta y = [0, 1) \rightarrow y = -2x$$

$$\Delta y = [-1, 0) \rightarrow y = -2x-1$$

$$\Delta y = [-2, -1) \rightarrow y = -2x-2$$



مسئله 4

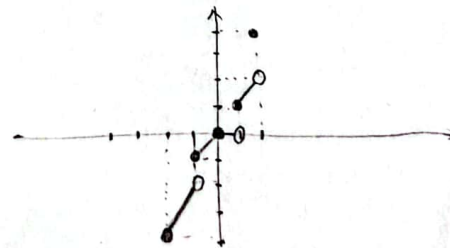
$$\omega) y = [x] |x| \Rightarrow \Delta y = f(x) - f$$

$$\Delta y = [1, 2) \rightarrow x$$

$$\Delta y = [0, 1) \rightarrow 0$$

$$\Delta y = [-1, 0) \rightarrow -|x| \rightarrow x$$

$$\Delta y = [-2, -1) \rightarrow -2|x| \rightarrow 2x$$



$$\omega) y = x - [x] \rightarrow 0 \leq x - [x] < 1 \rightarrow R_y = [0, 1)$$

$$\omega) y = x - f[x] \rightarrow 0 \leq x - [x] < 1 \Rightarrow 0 \leq x - [x] < 1 \Rightarrow R_y = [0, 1)$$

مسئله 5

$$\omega) y = x - \omega\left(\frac{x}{\omega}\right) \rightarrow \omega\left(\frac{x}{\omega} - \left[\frac{x}{\omega}\right]\right) \Rightarrow 0 \leq \omega\left(\frac{x}{\omega} - \left[\frac{x}{\omega}\right]\right) < \omega \rightarrow R_y = [0, \omega)$$

$$\omega) y = [x] - 2x \rightarrow 0 \leq x - [x] < 1 \Rightarrow 0 \leq [x] - 2x < -1 \rightarrow R_y = (-1, 0]$$