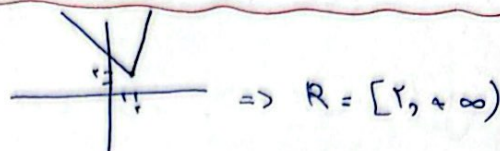


الف)  $x + |2x - 4|$

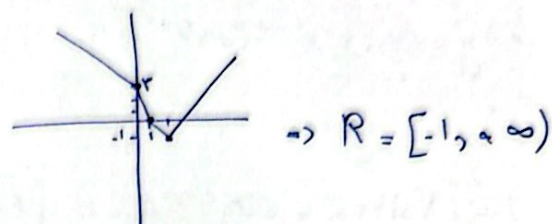
$$\begin{array}{c|c} 2 & \\ \hline -x+4 & 3x-4 \\ \hline \textcircled{2} & \end{array}$$



-۱

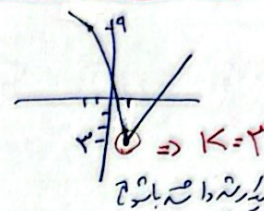
ب)  $y = |x - 2| + |x - 1| - |x|$

$$\begin{array}{c|c|c} 0 & 1 & 2 \\ \hline -x+3 & x-1 & x-2 \\ \hline 3 & 0 & -1 \end{array}$$



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

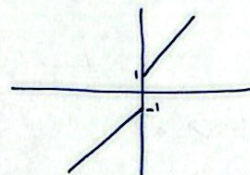
$$\begin{array}{c|c|c} -2 & 1 & \\ \hline -3x+3+x+2 & -3x+3-x-2 & 3x-3-x-2 \\ \hline -2x+5 & -4x+1 & 2x-5 \\ \hline 5 & -1 & \end{array}$$



-۲

الف)  $y = x + \frac{x}{|x|}$

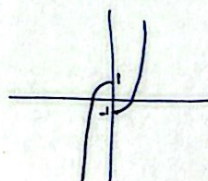
$$\begin{cases} x+1 & x > 0 \\ x-1 & x < 0 \end{cases}$$



-۳

ب)  $y = x|x| - \frac{x}{|x|}$

$$\begin{cases} x^2 - 1 & x > 0 \\ -x^2 + 1 & x < 0 \end{cases}$$



الف)  $y = [x] - 2x$

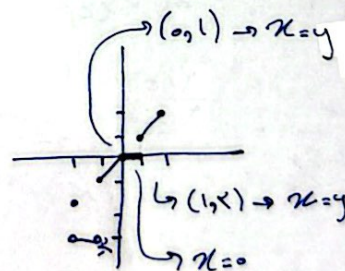
$$\begin{cases} -x & x \in \mathbb{Z} \\ [-x] & x \notin \mathbb{Z} \end{cases}$$



-۴

ب)  $y = [x]|x|$

$$\begin{cases} x^2 & x > 0, x \in \mathbb{Z} \\ x[x] & x > 0, x \notin \mathbb{Z} \\ -x^2 & x < 0, x \in \mathbb{Z} \\ -x[x] & x < 0, x \notin \mathbb{Z} \end{cases}$$



الف)  $3x - [3x] \rightarrow = 3x \Rightarrow 3x \in [0, 1)$

یعنی آن قسمت اعشاری را میبینیم  $\rightarrow [0, 1)$

ب)  $x - 5[\frac{x}{5}]$

$R = [0, 5)$

ج)  $[x] + x \rightarrow R = (-1, 0)$

-۵

ب)  $4x - 4[x] = 4(x - [x]) = 4x \Rightarrow 4x \in [0, 4)$

$x \in [0, 1)$

$\Rightarrow R = [0, 4)$

$y = -\frac{1}{2}x$

قسمت اعشاری را میبینیم

$$الف) y = 3\sin x + 2\cos x \rightarrow -\sqrt{a^2+b^2} \leq a\sin x + b\cos x \leq \sqrt{a^2+b^2}$$

$$-\sqrt{9+4} \leq y \leq \sqrt{9+4} \Rightarrow -\sqrt{13} \leq y \leq \sqrt{13} \Rightarrow R = [-\sqrt{13}, \sqrt{13}]$$

$$ب) y = 4\sin x - 3\cos x \rightarrow -\sqrt{16+9} \leq y \leq \sqrt{16+9} \Rightarrow R = [-5, 5]$$

$$ج) = [2\sin x + 3\cos x] \rightarrow -\sqrt{4+9} \leq y \leq \sqrt{4+9} \Rightarrow -\sqrt{13} \leq y \leq \sqrt{13}$$

$$\Rightarrow R = \{-9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

$$د) y = \sqrt{\cos x - 2\sin x} \rightarrow -\sqrt{1+4} \leq y \leq \sqrt{1+4} \rightarrow -\sqrt{5} \leq y \leq \sqrt{5} \Rightarrow R = [-\sqrt{5}, \sqrt{5}]$$

$$الف) y = \sin^2 x + 3\sin x + 2 \quad \left| \begin{array}{l} \frac{b}{a} = \frac{3}{1} \\ \frac{9}{1} + \frac{9}{1} + \frac{4}{1} = \frac{22}{1} \end{array} \right| \quad \left| \begin{array}{l} 1 \\ 1+3+2=6 \end{array} \right| \quad \left| \begin{array}{l} -1 \\ 1-3+2=0 \end{array} \right|$$

$$\Rightarrow R = \left[-\frac{1}{4}, 6\right]$$

$$ب) 2\sin^2 x + 3\sin x + 2 \quad \left| \begin{array}{l} \frac{b}{a} = \frac{3}{2} \\ \frac{9}{4} + \frac{9}{2} + \frac{4}{2} = \frac{17}{2} \end{array} \right| \quad \left| \begin{array}{l} 1 \\ 2+3+2=7 \end{array} \right| \quad \left| \begin{array}{l} -1 \\ 2-3+2=1 \end{array} \right|$$

$$R = \left[\frac{7}{2}, 7\right]$$

$$الف) \sin^2 x + 3\cos^2 x \rightarrow \sin^2 x + \cos^2 x + 2\cos^2 x = 1 + 2\cos^2 x$$

$$0 \leq \cos^2 x \leq 1 \Rightarrow 0 \leq 2\cos^2 x \leq 2 \Rightarrow 1 \leq 1 + 2\cos^2 x \leq 3 \Rightarrow R = [1, 3]$$

$$ب) \frac{2\cot x}{1+\cot^2 x} = \frac{2 \frac{\cos x}{\sin x}}{\frac{1}{\sin^2 x}} = 2\cos x \sin x = \sin(2x) \Rightarrow R = [-1, 1]$$

$$الف) y = \sin^6 x + \cos^6 x = (\sin^2 x + \cos^2 x)(\sin^4 x + \cos^4 x - \sin^2 x \cos^2 x)$$

$$= (\sin^2 - \cos^2)^2 = (-\cos(2x))^2 \Rightarrow R = [0, 1]$$

$$ب) [\sin^2 x + \cos^2 x]$$

$$الف) y = \frac{x^2 + \sqrt{x} - 1}{x + 1} = x - 1 \rightarrow R = \mathbb{R} \quad ب) \frac{x^2 - 1}{x - 1} = \frac{(x-1)(x+1)}{x-1}$$

$$x^2 + x + 1 \rightarrow \left| \begin{array}{l} \frac{b}{a} = \frac{1}{1} \\ \frac{1}{1} + \frac{1}{1} + 1 = \frac{3}{1} \end{array} \right|$$

$$R = \left[\frac{3}{4}, \infty\right)$$