

الف) $y = x + |2x - 4|$

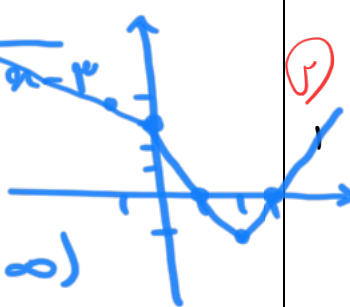
$$\begin{array}{c|c} 2 & \\ \hline -x+2 & 2x-4 \\ \hline x & \end{array}$$



$\rightarrow R_y = [2, +\infty)$

ب) $y = |x - 2| + |x - 1| - |x|$

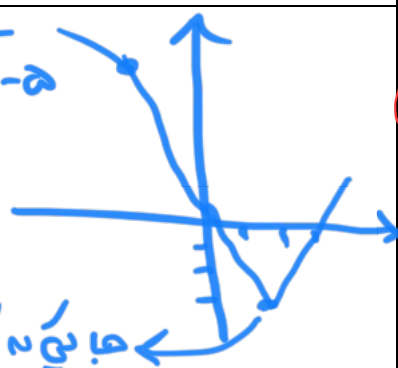
$$\begin{array}{c|c|c|c} 0 & 1 & 2 & \\ \hline -x+1 & -x & -x & x-2 \\ \hline -x+1 & +x & +1 & x-2 \end{array}$$



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

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

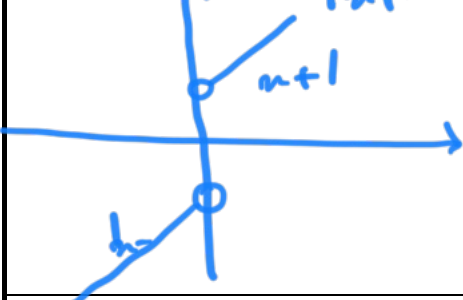
$$\begin{array}{c|c|c} -3 & -1 & \\ \hline -x+2 & -x+1 & 3x-3 \\ \hline -x+2 & -x+1 & 3x-3 \end{array}$$



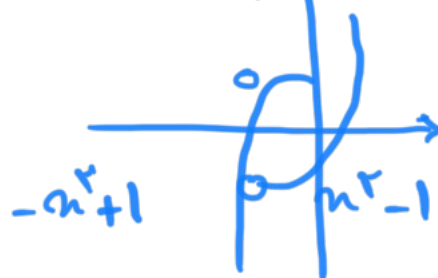
$y = -3 \rightarrow k = -3$

حالتی که در مسئله داریم

الف) $y = x + \frac{x}{|x|} \rightarrow x = 0$



ب) $y = x|x| - \frac{x}{|x|}$

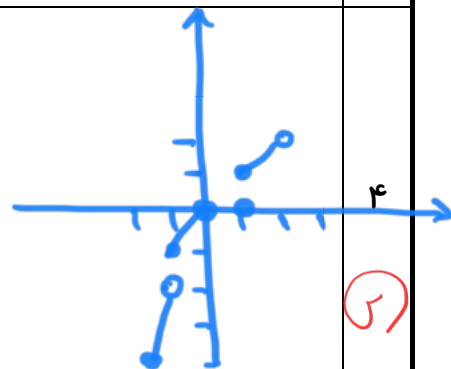
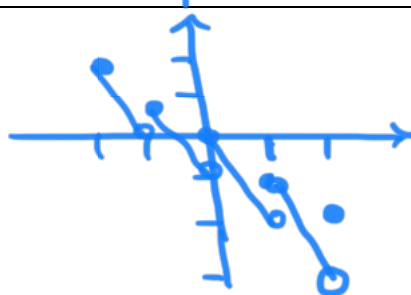


الف) $y = [x] - 2x$

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

ب) $y = [x]|x|$

$|2x| - x \quad 0 \quad x$



الف) $y = 3x - [3x] \rightarrow R_y = [0, 1)$

ب) $y = 4x - 4[x] = 4(x - [x]) \rightarrow R_y = [0, 4)$

ج) $y = x - 5[\frac{x}{5}] = 5(\frac{x}{5} - [\frac{x}{5}]) \rightarrow R_y = [0, 5)$

د) $y = [2x] - 2x = -(2x - [2x]) \rightarrow R_y = (-1, 0]$

ا) $y = 3 \sin u + 4 \cos u \rightarrow -\sqrt{9+16} \leq y \leq \sqrt{9+16} \rightarrow R_y = [-5, 5]$

ب) $y = 5 \sin u - 3 \cos u \rightarrow -\sqrt{25+9} \leq y \leq \sqrt{25+9} \rightarrow R_y = [-\sqrt{34}, \sqrt{34}]$

ج) $y = \frac{t \sin u + \cos u}{t} \rightarrow -\sqrt{1+1} \leq t \leq \sqrt{1+1} \rightarrow \{u \in \mathbb{R} \mid -\sqrt{2} \leq t \leq \sqrt{2}\}$

د) $y = \sqrt{\frac{\cos u - 4 \sin u}{t}} \rightarrow \sqrt{2} \leq t \leq \sqrt{2} \rightarrow R_y = [0, \sqrt{2}]$

$y = \sin^2 u + 4 \sin u + 4$
 $\max u \rightarrow y = 9$
 $\min \rightarrow y = 0$
 $-\frac{b}{2a} \rightarrow 0.5i$

ب) $y = \sin^2 u + 4 \sin u + 4$
 $\max u \rightarrow y = 9$
 $\min \rightarrow y = 0$
 $-\frac{b}{2a} = u = \frac{v}{\lambda}$

ا) $y = \sin^2 u + 4 \cos^2 u = 3 \cos^2 u + 1 \rightarrow 1 \leq 3 \cos^2 u + 1 \leq 5$
 $\rightarrow R_y = [1, 5]$

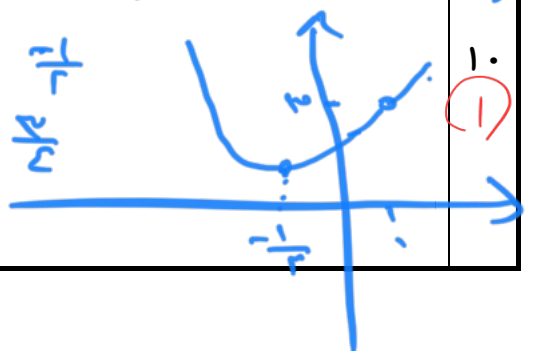
ب) $y = \frac{t \cot u}{1 + \cot^2 u} = t \cos u \sin u = \sin^2 u \rightarrow R_y = [-1, 1]$

ا) $y = \sin^4 u + \cos^4 u \rightarrow k \cdot 2 \rightarrow \frac{1}{2} \leq y \leq 1$
 $\rightarrow R_y = [\frac{1}{2}, 1]$

ب) $y = \frac{\sin^4 u + \cos^4 u}{t} \rightarrow k \cdot 2 \rightarrow \frac{1}{\lambda} \leq y \leq 1$
 $\rightarrow R_y = \{0, 1\}$

ا) $y = \frac{2u^2 + 4u - 1}{u + 1} \rightarrow 2u^2 + (4-y)u - 1 + y = 0$
 $\rightarrow y^2 - 1 \leq y + 1 + 4y - 4 \geq 0 \rightarrow R_y = (-\infty, -1] \cup [-1, +\infty)$

ب) $y = \frac{u^2 - 1}{u - 1} = u^2 + u + 1$
 $u \neq 1$
 $\rightarrow R_y = [\frac{5}{4}, +\infty)$



ا) $\frac{(u+1)(u-1)}{(u+1)} \rightarrow u \neq -1 \rightarrow R = \mathbb{R} - \{-1\}$