

الف) $y \leq r \sin n + r \cos n$

$$\sqrt{9+r} \leq r \sin n + r \cos n \leq \sqrt{9+r} \rightarrow Ry \leq [-\sqrt{13}, \sqrt{13}]$$

$$\rightarrow -\sqrt{5} \leq \cos n - r \sin n \leq \sqrt{5}$$

$$\rightarrow Ry \leq [0, \sqrt{5}]$$

ب) $-\sqrt{13+r} \leq r \sin n - r \cos n \leq \sqrt{13+r} \rightarrow Ry \leq [-5, 5]$

2) $-\sqrt{r+25} \leq r \sin n + 5 \cos n \leq \sqrt{r+25} \rightarrow Ry \leq \{-5, -5, \dots, 0, \dots, 5\}$

$\sqrt{25} = 5$

الف) $\sin^2 n + r \sin n + r$

$$Ry \leq [0, 6]$$

ب) $r \sin^2 n + r \sin n + r$

$$Ry \leq \left[\frac{r}{\lambda}, r \right]$$

الف) $y \leq \sin^2 n + r \cos^2 n = 1 - \cos^2 n + r \cos^2 n = 1 + r \cos^2 n$

$$0 \leq \cos^2 n \leq 1 \rightarrow Ry \leq [1, r]$$

ب) $y \geq \frac{r \cot n}{1 + \cot^2 n} = \frac{r \cos n}{\sin n} = r \sin n \cos n = \sin^2 n \rightarrow Ry \leq [-1, 1]$

الف) $r \leq \sin^2 n + \cos^2 n \leq 1 \rightarrow Ry \leq \left[\frac{1}{r}, 1 \right]$

$y \leq r \times \odot_k$

ب) $y \leq \frac{1-r}{r} \leq \sin^2 n + \cos^2 n \leq 1 \rightarrow \frac{1}{\lambda} \leq \sin^2 n + \cos^2 n \leq 1 \rightarrow Ry \leq \{0, 1\}$

$\lambda \leq r \times \odot_k$

الف) $y \leq \frac{r n^2 + v n - r}{n + r} \leq \frac{(n+r)(r n - 1)}{n + r} \leq r n - 1$

$Ry = \mathbb{R} - \{-9\}$

ب) $y \leq \frac{n^2 - 1}{n - 1} = \frac{(n-1)(n+1)}{(n-1)} = n + 1$

$\left[\frac{r}{r}, +\infty \right) - \{r\}$

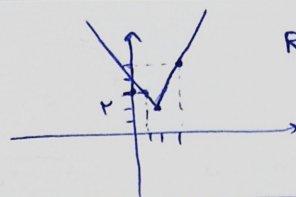
$\frac{-b}{2a} = \frac{-1}{2}$

17, 180

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الف) $y \leq |2x-4|$
 $\begin{matrix} 2 \\ x=2 \end{matrix}$

$$\frac{x-2x+4}{-x+4} \quad \frac{x+2x-4}{3x-4}$$

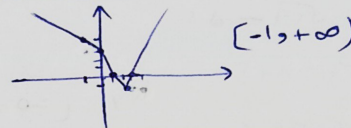


$R_y \leq [2, +\infty)$

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ب) $y \leq |x-2| + |x-1| - |x|$

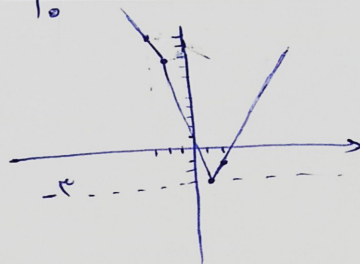
$$\frac{-x+2-x+1+x}{-x+3} \quad \frac{-x+2-x+1-x}{-3x+3} \quad \frac{-x+2-x-1-x}{-3x-1} \quad \frac{x-2+x-1-x}{x-3}$$



$k \leq -3$

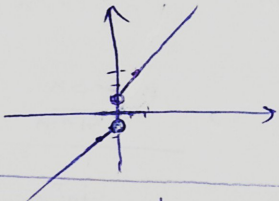
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$$\frac{-3x+2-x+2}{-4x+4} \quad \frac{-x-2-3x+3}{-4x+1} \quad \frac{3x-2-x-2}{2x-4}$$



الف) $y \leq x + \frac{x}{|x|}$

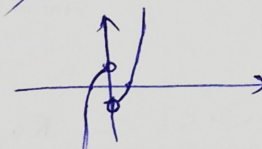
$$\frac{x+\frac{x}{x}}{x-1} \quad \frac{x+\frac{x}{x}}{x+1}$$



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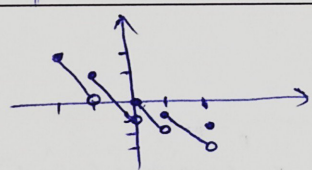
ب) $y \leq x|x| - \frac{x}{|x|}$

$$\frac{-x^2+1}{x^2-1} \quad \frac{x^2-1}{x^2-1}$$



الف) $y \leq [x] - 2x \rightarrow |x|$

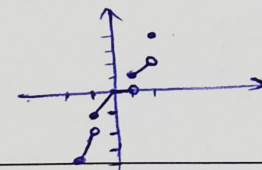
$[0,1) \rightarrow [x] \leq 0 \rightarrow -2x$ $[-1,0) \rightarrow [x] \leq -1 \rightarrow -2x-1$
 $[1,2) \rightarrow [x] \leq 1 \rightarrow -2x+1$ $[-2,-1) \rightarrow [x] \leq -2 \rightarrow -2x-2$



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ب) $y \leq [x]|x| \rightarrow |x|$

$[0,1) \rightarrow 0$ $[-1,0) \rightarrow x$
 $[1,2) \rightarrow x$ $[-2,-1) \rightarrow 2x$



الف) $y \leq 3x - [3x] \rightarrow 0 \leq \{3x\} - \{x\} < 1 \rightarrow R_y \leq [0,1)$

ب) $y \leq x - \{x\} \rightarrow \{x - [x]\} \rightarrow 0 \leq x - [x] < 1 \rightarrow R_y \leq [0,1)$

ج) $y \leq x - \{ \frac{x}{2} \} \rightarrow \{ \frac{x}{2} - [\frac{x}{2}] \} \rightarrow 0 \leq \frac{x}{2} - [\frac{x}{2}] < 1 \rightarrow R_y \leq [0,1)$

د) $y \leq [2x] - 2x \rightarrow -1 < \{2x\} - \{x\} \leq 0 \rightarrow R_y \leq (-1,0]$

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