

الف) $(x-1)^2 + 1 \rightarrow y-1 \rightarrow (x-1)^2 \rightarrow x-1 \rightarrow \sqrt{y-1}$
 $\rightarrow x = \sqrt[3]{y-1} + 1 \rightarrow R_f = \mathbb{R}$

ب) $\frac{1}{x^2 - 2x} \quad yx^2 - 2xy = 1 \rightarrow yx^2 - 2xy - 1 = 0$

$x = \frac{+2y \pm \sqrt{4y^2 + 4y}}{-2y} \rightarrow 4y(y+1) \geq 0$

$y \leq -1$ or $y \geq 0$

$R_f = (-\infty, -1] \cup [0, +\infty)$

10 $R_f = (-\infty, -1] \cup [0, +\infty)$

الف) $y = x^2 - 4x + 10$ min $\left| \begin{matrix} 2 \\ 9 \end{matrix} \right|$

$R_f = [4, +\infty)$

15 ب) $y = -x^2 + 4x + 2$ max $\left| \begin{matrix} 2 \\ 12 \end{matrix} \right|$

$R_f = (-\infty, 12]$

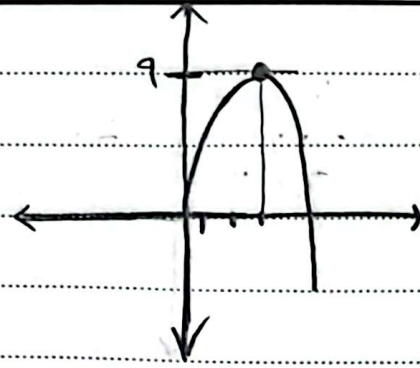
20 ج) $y = \sqrt{x^2 - 4x - 4}$ min $\left| \begin{matrix} 2 \\ -4 \end{matrix} \right|$

$R_f = \sqrt{[-4, +\infty)} = [0, +\infty)$

25

$$1) y = \sqrt{-x^2 + 4x} \quad \text{max} \quad \begin{matrix} 4 \\ 9 \end{matrix}$$

$$R_f = \sqrt{(-\infty, 9]} = (0, 3]$$



$$R_f = \sqrt{R} = [0, +\infty) \quad (2) \quad R_f = \sqrt{R} = (-\infty, 0] \quad R_f = \sqrt{R} = (-\infty, +\infty)$$

$$R_f = [0, +\infty) \quad (1)$$

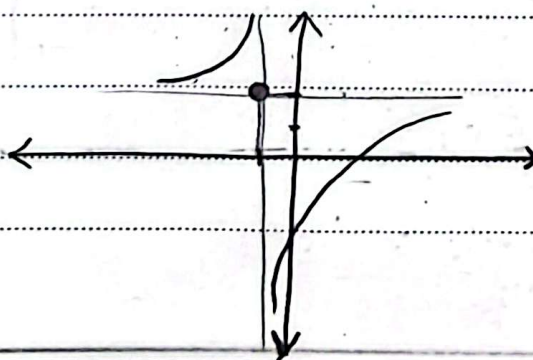
$$\text{الف) } R_f = \mathbb{R} - \{c\} \quad \text{ب) } R_f = \mathbb{R} - \{r\}$$

$$15 \quad \text{الف) } \sqrt{\mathbb{R} - \{r\}} = [0, +\infty) - \{\sqrt{r}\}$$

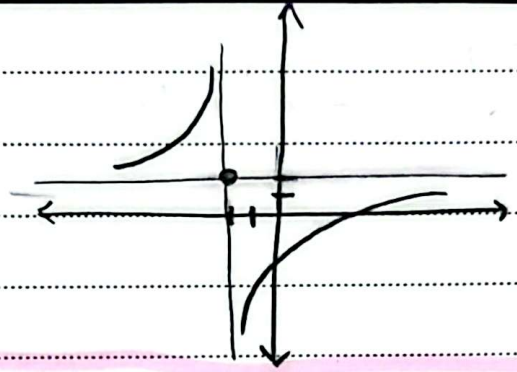
$$\text{ب) } \sqrt{\mathbb{R} - \{-r\}} = [0, +\infty)$$

$$20 \quad \text{الف) } y = \frac{2x-3}{x+1}$$

مجاوب تمام $-1 \leq x \leftarrow$ ریش مجز $2 \leq y \leftarrow$ مجاوب اقس $\frac{a}{c}$



ب) $y = \frac{2x-1}{x+2}$ ۲ جانب افقی
-۲ جانب عمودی



الف) $\sin x + \frac{1}{\sin x}$ $R_f = (-\infty, -2] \cup [2, +\infty)$ (✓)
بین -۱ و ۱

ب) $\frac{x^2+1}{x^2+1} \cdot x^2 + \frac{1}{x^2}$ $R_f = (-\infty, -2] \cup [2, +\infty)$

ج) $\sqrt[3]{x^2} + \frac{1}{\sqrt[3]{x}}$ $R_f = (-\infty, -2] \cup [2, +\infty)$

د) $\sqrt{x} + \frac{1}{\sqrt{x}}$ $R_f = [2, +\infty)$

$y = x^2 + \frac{1}{x^2+3} \xrightarrow{-3+3} x^2+3 + \frac{1}{x^2+3} - 3$ (✓)

$R_f = \left[\frac{1}{3}, +\infty\right)$ $\min = \frac{10}{3} \quad \frac{10}{3} - \frac{9}{3} = \frac{1}{3}$

$y = \sqrt{x^2+9} + \frac{1}{\sqrt{x^2+9}} \rightarrow R_f = \left[\frac{10}{3}, +\infty\right)$

if $x^2 \leq 0 \rightarrow \min = 2$ 25

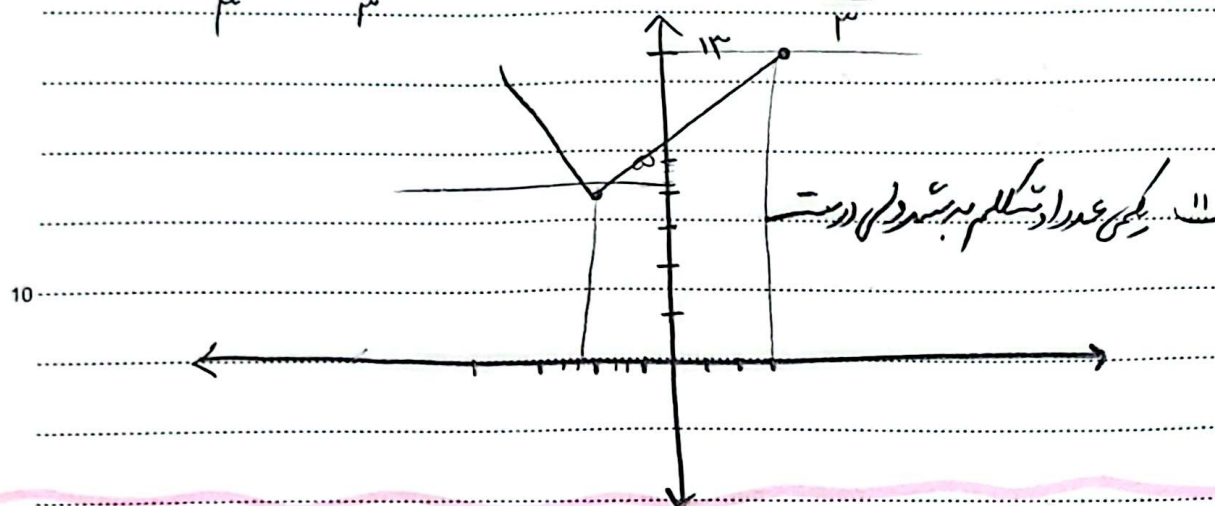
$$y \leq |x-3| + |3x+6|$$

$$\begin{array}{c|c|c} -3 & -\frac{6}{3} & -\frac{6}{3} \\ \hline -3 & -2 & -2 \end{array}$$

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

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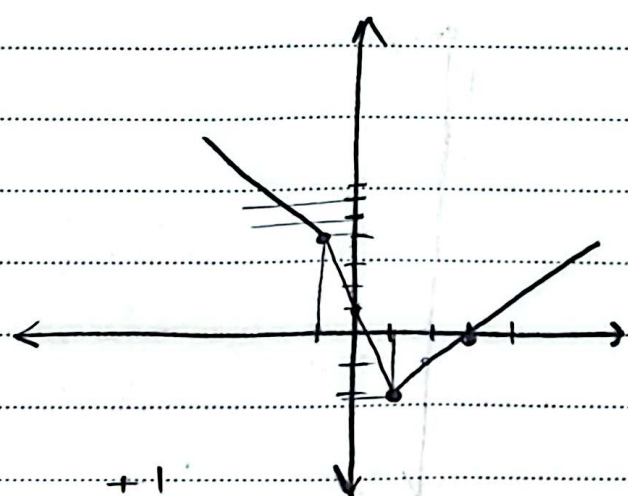
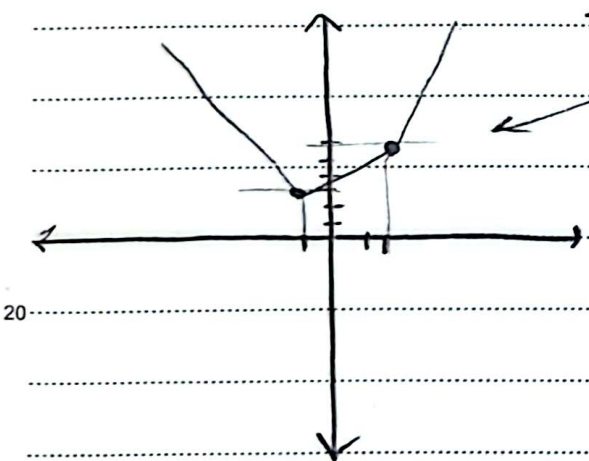
$$\begin{array}{c|c|c} -3 & -2 & -2 \\ \hline -3 & -2 & -2 \end{array}$$



$$y \leq |x-2| + |2x+2|$$

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

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



$$y \leq |2x-2| - |x+1|$$

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

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

