

الف) $y = x^3 - 3x^2 + 3x + 1 - 1$

$y = (x-1)^3 + 1$

$y-1 = (x-1)^3$

$(y-1)^3 = x-1$

$x = (y-1)^3 + 1 \rightarrow R = \mathbb{R}$

ب) $y = \frac{1}{x^2 - 2x + 1}$

$x^2 - 2x \neq 0 \rightarrow x(x-2) \neq 0 \rightarrow x \neq 0, x \neq 2$

$yx^2 - 2yx = 1 \rightarrow yx^2 - 2yx - 1 = 0$

$\Delta = 4y^2 - 4 \times y \times -1 = 4y^2 + 4y > 0 \rightarrow y(y+1) > 0$

$R = (-\infty, -1) \cup (0, \infty)$ ← از نصاب

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الف) $y = x^2 - 4x + 10$

$\Delta = b^2 - 4ac = 16 - 40 = -24 < 0$

$R = [4, \infty)$

ب) $y = -x^2 + 4x + 3$

$\Delta = 16 + 12 = 28$

$R = (-\infty, 12]$

ج) $y = \sqrt{x^2 - 4x - 3}$

$\Delta = 16 + 12 = 28$

$R = [0, \infty)$

د) $y = \sqrt{4x - x^2}$

$\Delta = 16 - 4 = 12$

$R = [-1, 1]$

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الف) $y = x^3 - 5x^2 + 2x + 1$

$R = \mathbb{R}$

ب) $y = x^3 - 4x^2 + 3x + 2$

$R = \mathbb{R}$

ج) $y = \sqrt{x^2 - 4x + 5x + 1}$

$\Delta = 16 - 4 = 12$
 $R = [0, \infty)$

د) $y = (x^2 - 4x + 5x + 1)^2$

$\Delta = 16 - 4 = 12$
 $R = [0, \infty)$

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الف) $y = \frac{3x+1}{x-2}$

$ad \neq cb, c \neq 0$
 $3 \neq 1, 1 \neq 0 \checkmark$

$R = \mathbb{R} - \{2\}$

ب) $y = \frac{2x+1}{x+1}$

$ad \neq cb, c \neq 0$
 $2 \neq 1, 1 \neq 0 \checkmark$

$R = \mathbb{R} - \{1\}$

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الف) $y = \sqrt{\frac{2x+5}{x+1}}$

$y = \frac{2x+5}{x+1} \rightarrow yx + y = 2x + 5$

$yx - 2x = 5 - y \rightarrow x(y-2) = 5-y \rightarrow x = \frac{5-y}{y-2}$

$R = \{2\}$

$y \neq 2$

$y = \sqrt{R - \{2\}} \Rightarrow R = [0, \infty) - \{\sqrt{2}\}$

ب) $y = \sqrt{\frac{2x+1}{2-x}}$

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

$R = \{2\} \leftarrow y \neq 2$

$\sqrt{R - \{2\}} = [0, \infty) - \{\sqrt{2}\}$

$R = [0, \infty)$

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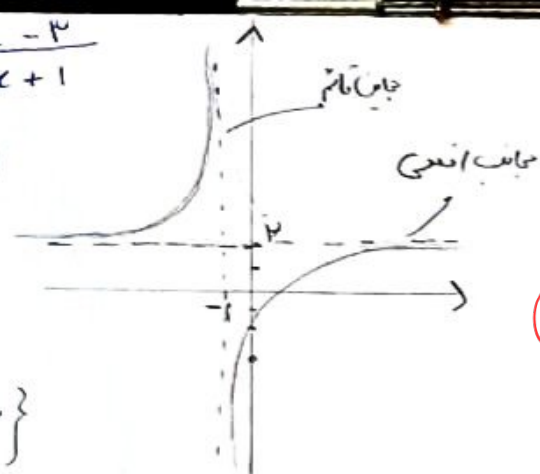
$$الف) y = \frac{2x-3}{x+1}$$

$$مجاہد قائم = -1$$

$$مجاہد افقی = 2$$

$$x=0 \rightarrow y=-3$$

$$R = R - \{2\}$$



$$ب) y = \frac{2x-1}{x+2}$$

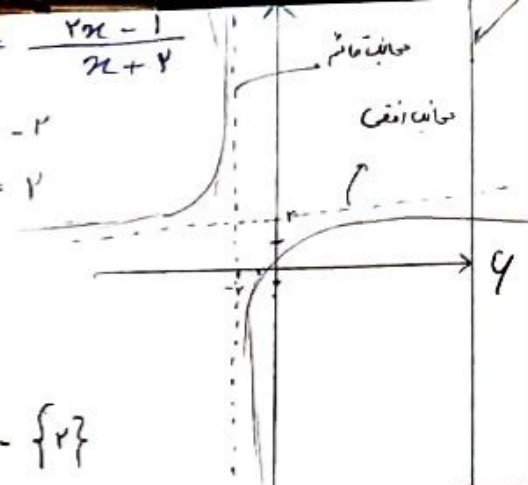
$$مجاہد قائم = -2$$

$$مجاہد افقی = 1$$

$$x=0$$

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

$$R = R - \{1\}$$



$$الف) \sin x + \frac{1}{\sin x}$$

$$a + \frac{1}{a}$$

$$-1 \leq \sin x \leq 1$$

$$-1 + (-\frac{1}{-1}) = -2$$

$$R = (-\infty, -2] \cup [2, \infty)$$

$$ب) \frac{x^3+1}{x^3}$$

$$x^3 + \frac{1}{x^3}$$

$$R = (-\infty, -1] \cup [1, \infty)$$

$$ج) \frac{\sqrt[3]{x^3+1}}{\sqrt[3]{x}}$$

$$\sqrt[3]{x} + \frac{1}{\sqrt[3]{x}}$$

$$R = (-\infty, -1] \cup [1, \infty)$$

$$د) \sqrt{x} + \frac{1}{\sqrt{x}}$$

$$R = [2, \infty)$$

$$الف) x^3 + \frac{1}{x^3+3}$$

$$x^3+3-3 + \frac{1}{x^3+3}$$

$$\rightarrow (x^3+3) + \frac{1}{(x^3+3)} - 3$$

$$R = [\frac{1}{3}, \infty)$$

$$\lim_{x \rightarrow \infty} \frac{1}{x^3+3} = 0 \rightarrow 3 + \frac{1}{3} - 3 = \frac{1}{3}$$

$$ب) \frac{x^3+3}{\sqrt{x^3+3}}$$

$$\frac{x^3+3+1}{\sqrt{x^3+3}} = \sqrt{x^3+3} + \frac{1}{\sqrt{x^3+3}}$$

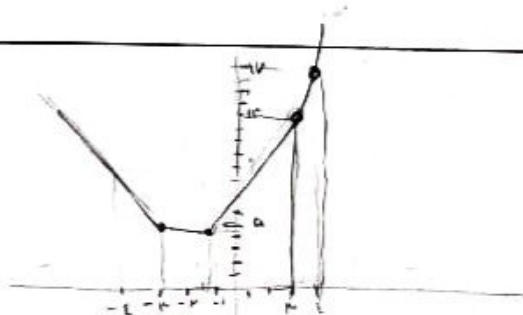
$$x=0 \rightarrow \sqrt{3} + \frac{1}{\sqrt{3}}$$

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

$$y = |x-3| + |3x+5|$$

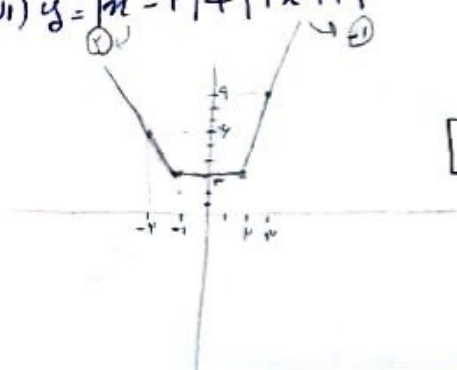
$$\begin{cases} x-3+3x+5 & x > 3 \\ -x+3+3x+5 & -\frac{5}{3} \leq x \leq 3 \\ -x+3-3x-5 & x < -\frac{5}{3} \end{cases} \rightarrow \begin{cases} 4x+2 & x > 3 \\ 2x+8 & -\frac{5}{3} \leq x \leq 3 \\ -4x-2 & x < -\frac{5}{3} \end{cases}$$

$$R = [\frac{11}{3}, \infty)$$



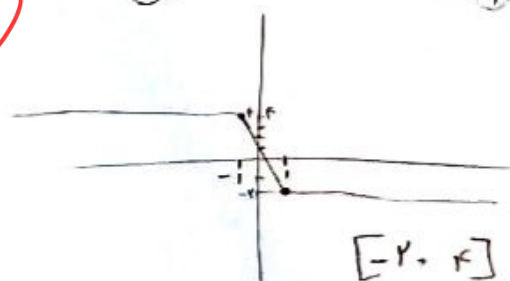
$$الف) y = |x-2| + |2x+2|$$

$$[2, \infty)$$



$$ب) y = |2x-2| - |x+1|$$

$$[-2, 4]$$



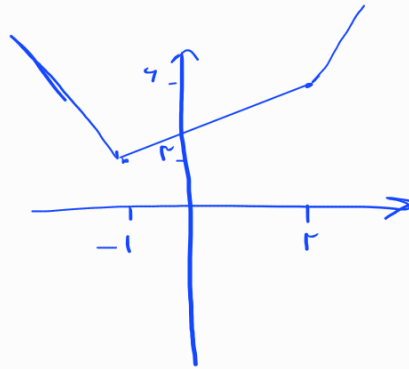
$$\sqrt{x^2 + r} + \frac{1}{\sqrt{x^2 + r}} \xrightarrow{x^2 = 0} \frac{2}{r}$$

$$R = \left[\frac{2}{r}, +\infty\right)$$

۸ ب)

$$\begin{array}{c|c|c} -1 & & r \\ \hline -r_2 & x+r & r_2 \end{array}$$

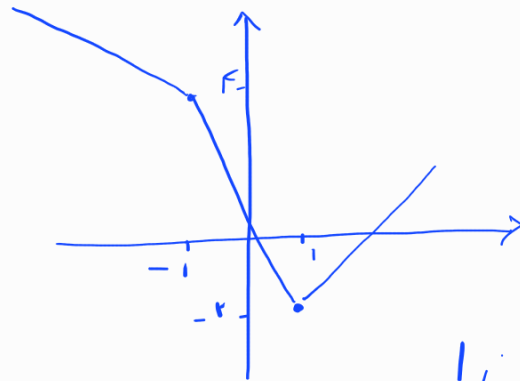
$$R = [r, +\infty)$$



۱۰ الف)

$$\begin{array}{c|c|c} -1 & & 1 \\ \hline -x+r & -r_2x+1 & x-r \end{array}$$

$$R = [-1, +\infty)$$



۱۱ ب)

نوشتن بردار ضابطه بندی