

الف) $y = x^3 - 3x^2 + 3x$

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

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

$\frac{-1}{+} \frac{0}{-} \Rightarrow R = (-\infty, -1] \cup (0, +\infty)$

الف) $y = x^2 - 4x + 10 \rightarrow \begin{cases} \frac{b}{2a} = \frac{4}{2} = 2 \\ 4 - 16 + 10 = -2 \end{cases} \Rightarrow R = [2, +\infty)$

ب) $-x^2 + 6x + 3 \rightarrow \begin{cases} \frac{b}{2a} = \frac{-6}{-2} = 3 \\ -9 + 18 + 3 = 12 \end{cases} \Rightarrow R = (-\infty, 12]$

ج) $\sqrt{x^2 - 4x - 3} \rightarrow \begin{cases} \frac{b}{2a} = \frac{4}{2} = 2 \\ 4 - 16 - 3 = -9 \end{cases} \quad R = [0, +\infty)$

د) $\sqrt{6x - x^2} \rightarrow \begin{cases} \frac{b}{2a} = \frac{-6}{-2} = 3 \\ 18 - 9 = 9 \end{cases} \quad R = [0, 3]$

الف) $y = x^3 - 8x^2 + 2x + 1 \rightarrow R = \mathbb{R}$

ج) $\sqrt{x^4 - 6x^2 + 8x + 1} \rightarrow R = [0, +\infty)$

ب) $y = x^4 - 6x^2 + 3x + 2 \rightarrow R = \mathbb{R}$

د) $y = (x^2 - 4x^2 + 3x + 1)^2 \rightarrow R = [0, +\infty)$

الف) $y = \frac{3x+1}{x-2} \rightarrow R = \mathbb{R} - \{2\}$

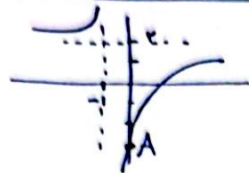
ب) $y = \frac{2x+1}{x+1} \rightarrow R = \mathbb{R} - \{1\}$

الف) $y = \sqrt{\frac{2x+4}{x+1}} \rightarrow R = \sqrt{\mathbb{R} - \{-2\}} \rightarrow [0, +\infty) - \{\sqrt{2}\}$

ب) $y = \sqrt{\frac{3x+1}{2-x}} \rightarrow R = [0, +\infty)$

$\hookrightarrow \frac{a}{c} = -2$

الف) $y = \frac{2x-3}{x+1}$



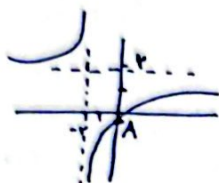
مجاہد قائم $= -1$
مجاہد افقی $= 2$

$A = \begin{vmatrix} 0 \\ -3 \end{vmatrix}$

-6

5

ب) $y = \frac{2x-1}{x+2}$



مجاہد قائم $= -2$
مجاہد افقی $= 2$

$A = \begin{vmatrix} 0 \\ -1/2 \end{vmatrix}$

الف) $\sin x \cdot \frac{1}{\sin x} \rightarrow (-\infty, -2] \cup [2, +\infty) \leftarrow R$

-7

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

5

ج) $\frac{\sqrt{x^2+1}}{\sqrt{x}} \rightarrow \sqrt{x} + \frac{1}{\sqrt{x}} \rightarrow (-\infty, 2] \cup [2, +\infty) \leftarrow R$

د) $y = \sqrt{x} \cdot \frac{1}{\sqrt{x}} \rightarrow [2, +\infty) \leftarrow R$

الف) $y = x^2 + \frac{1}{x^2+3} \xrightarrow{+3-3} \frac{x^2+3}{x^2+3} + \frac{1}{x^2+3} - 3 \Rightarrow R = [-1, +\infty)$

-8

1

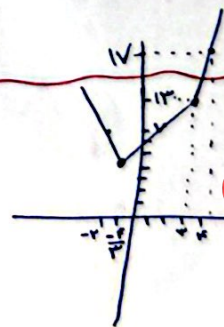
ب) $y = \frac{x^2+5}{\sqrt{x^2+4}} \rightarrow \frac{x^2+4}{\sqrt{x^2+4}} + \frac{1}{\sqrt{x^2+4}} \Rightarrow R = [\frac{14}{5}, +\infty)$

$\frac{14}{5}$ کمترین مقدار $\leftarrow$ $\frac{4}{3}$ کمترین مقدار

$y = |x-3| + |2x+4|$

x	$-x+3$	$-2x-4$	$3-x+2x+4$	$x-3+2x+4$
$x < -2$	$-x+3$	$-2x-4$	$3-x+2x+4$	$x-3+2x+4$
$-2 < x < 3$	$-x+3$	$2x+4$	$3-x+2x+4$	$x-3+2x+4$
$x > 3$	$x-3$	$2x+4$	$3-x+2x+4$	$x-3+2x+4$

$\begin{vmatrix} -2 \\ 4 \\ 14 \end{vmatrix}$



-9

5

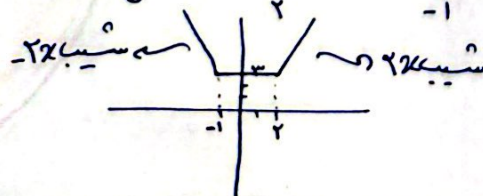
الف) $y = |x-2| + |2x+2|$

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

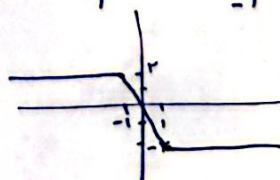
ب) $y = |\frac{x-2}{1}| - |\frac{x+1}{-1}|$

$R = [-2, 2]$

-10



10



$$x^r + r + \frac{1}{x^r + r} - r \xrightarrow{x^r = -} \frac{1}{r} \quad R = \left[\frac{1}{r}, +\infty\right)$$

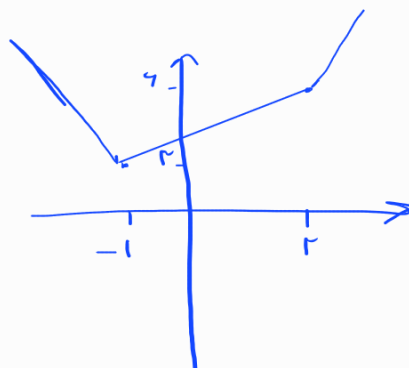
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$$\sqrt{x^r + r} + \frac{1}{\sqrt{x^r + r}} \xrightarrow{x^r = 0} \frac{2}{r} \quad R = \left[\frac{2}{r}, +\infty\right)$$

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

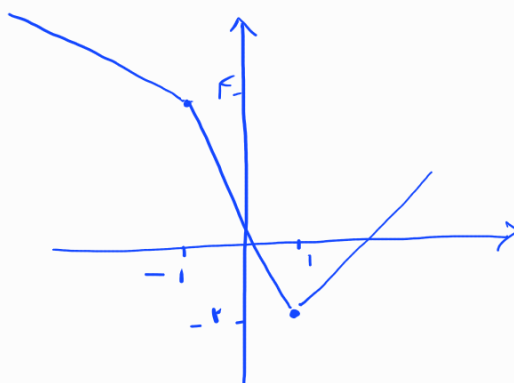
$$R = [r, +\infty)$$



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

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



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