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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) $y = x^2 - 4x + 10 \rightarrow \begin{cases} \frac{b}{4a} = \frac{4}{4} = 1 \\ 4 - 1 + 10 = 6 \end{cases} \Rightarrow R = [6, +\infty)$

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ب) $-x^2 + 6x + 3 \rightarrow \begin{cases} \frac{b}{4a} = \frac{-6}{-4} = 1.5 \\ -9 + 18 + 3 = 12 \end{cases} \Rightarrow R = (-\infty, 12]$

ج) $\sqrt{x^2 - 4x - 3} \rightarrow \begin{cases} \frac{b}{4a} = \frac{4}{4} = 1 \\ 4 - 1 - 3 = 0 \end{cases} \quad R = [0, +\infty)$

د) $\sqrt{6x - x^2} \rightarrow \begin{cases} \frac{b}{4a} = \frac{-6}{-4} = 1.5 \\ 18 - 9 = 9 \end{cases} \quad R = [0, 3]$

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

ج) $\sqrt{x^4 - 6x^2 + 5} \rightarrow R = [0, +\infty)$

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

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

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

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

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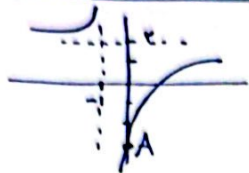
الف) $y = \sqrt{\frac{2x+4}{x+1}} \rightarrow R = \sqrt{\mathbb{R} - \{-2\}} \rightarrow [0, +\infty) - \{\sqrt{2}\}$

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

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

الف) $y = \frac{2x-3}{x+1}$

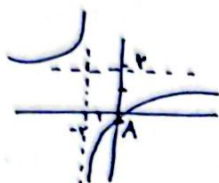


مجاہد قائم $= -1$ $\rightarrow$ جانب قائم
 جانب افقی $= 2$

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

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ب) $y = \frac{2x-1}{x+2}$



مجاہد قائم $= -2$
 جانب افقی $= 2$

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

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

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

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

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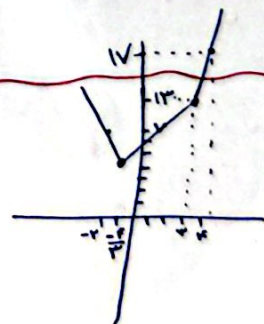
ب) $y = \frac{x^2+5}{\sqrt{x^2+4}} \rightarrow \underbrace{x^2+4}_{[4, +\infty)} + \frac{1}{x^2+4} \Rightarrow R = [\frac{17}{4}, +\infty)$

$\frac{17}{4}$ کمترین مقدار $\leftarrow$ $\frac{4}{3}$ کمترین مقدار

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

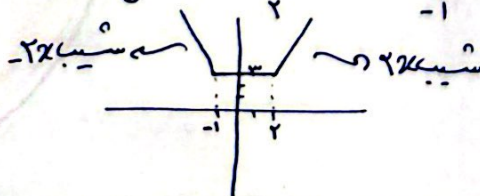
x	$-x+3$	$-2x-4$	$3-x+2x+4$	$x-3+2x+4$
$x < -2$	$-x+3$	$-2x-4$	$3-x+2x+4 = x+7$	$x-3+2x+4 = 3x+1$
$-2 < x < 3$	$-x+3$	$2x+4$	$3-x+2x+4 = x+7$	$x-3+2x+4 = 3x+1$
$x > 3$	$x-3$	$2x+4$	$3-x+2x+4 = x+7$	$x-3+2x+4 = 3x+1$

$\begin{vmatrix} -2 \\ 4 \\ 17 \end{vmatrix}$

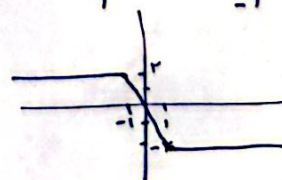


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الف) $y = |\frac{x-2}{2}| + |\frac{2x+2}{-1}| \Rightarrow R = [2, +\infty)$



ب) $y = |\frac{2x-2}{1}| - |\frac{x+1}{-1}| \Rightarrow R = [-2, 2]$



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