

الف) $y = x^3 - 3x^2 + 3x \Rightarrow y+1 = x^3 - 3x^2 + 3x + 1$

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

ب) $y = \frac{1}{x^2 - 2x} \Rightarrow x^2 y - 2xy = 1 \Rightarrow x^2 - 2x = \frac{1}{y} \Rightarrow x^2 - 2x = \frac{1}{y} + 1$

$\Rightarrow (x-1)^2 = \frac{y+1}{y} \Rightarrow x-1 = \sqrt{\frac{y+1}{y}} \Rightarrow x = \sqrt{\frac{y+1}{y}} + 1 \Rightarrow \frac{y+1}{y} \geq 0$
 $\Rightarrow R_y = (-\infty, -1) \cup (0, +\infty)$

الف) $y = x^2 - 6x + 10 \quad \text{ext} \left| \begin{matrix} -\frac{6}{2} = 3 \\ a > 0 \end{matrix} \right\} \Rightarrow R_y = [1, +\infty)$

ب) $y = -x^2 + 6x + 7 \quad \text{ext} \left| \begin{matrix} \frac{6}{2} = 3 \\ a < 0 \end{matrix} \right\} \Rightarrow R_y = (-\infty, 12]$

ج) $y = \sqrt{x^2 - 6x + 7} \quad \text{ext} \left| \begin{matrix} \frac{6}{2} = 3 \\ a > 0 \end{matrix} \right\} \Rightarrow R_y = [0, +\infty)$

د) $y = \sqrt{4x - x^2} \Rightarrow y = \sqrt{-x^2 + 4x} \quad \text{ext} \left| \begin{matrix} \frac{4}{2} = 2 \\ a < 0 \end{matrix} \right\} \Rightarrow R_y = [0, 2]$

الف) $y = x^2 - 5x^2 + 2x + 1 \Rightarrow R_y = \mathbb{R}$

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

ج) $y = \sqrt{x^2 - 6x^2 + 5x + 1} \Rightarrow R_y = [0, +\infty)$

د) $y = (x^2 - 6x^2 + 3x + 1)^{2/3} \Rightarrow R_y = [0, +\infty)$

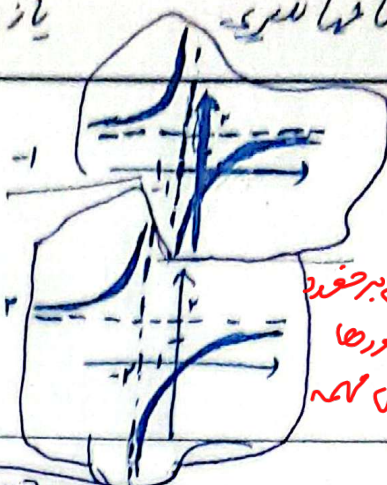
الف) $y = \frac{3x+1}{x-2} \quad \text{ad} \neq bc \Rightarrow R_y = \mathbb{R} - \{3\}$

ب) $y = \frac{3x+1}{x+1} \quad \text{ad} \neq bc \Rightarrow R_y = \mathbb{R} - \{3\}$

الف) $y = \sqrt{\frac{3x+1}{x+1}} \Rightarrow R_y = [0, +\infty) - \{3\}$

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

الف) $y = \frac{2x-3}{x+1} \rightarrow \begin{cases} \text{میانگین} = \frac{a}{c} = 2 \\ \text{رشته منفرجه} = -1 \end{cases}$
 $x=0 \Rightarrow y = -3$ ✓



(2)

ب) $y = \frac{2x-1}{x+2} \rightarrow \begin{cases} \text{میانگین} = \frac{a}{c} = 2 \\ \text{رشته منفرجه} = -2 \end{cases}$
 $x=0 \Rightarrow y = -\frac{1}{2}$ ✓

محله بر صفر
با محورها
خوبی می

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الف) $y = \frac{1}{\sin x} \Rightarrow R_y = (-\infty, -1] \cup [1, +\infty)$ ✓

ب) $y = \frac{1}{\cos x} \Rightarrow R_y = (-\infty, -1] \cup [1, +\infty)$ ✓

ج) $y = \frac{1}{\sqrt{x}} \Rightarrow R_y = (-\infty, -1] \cup [1, +\infty)$ ✓

د) $y = \frac{1}{\sqrt{x}} \Rightarrow R_y = [1, +\infty)$ ✓

(2)

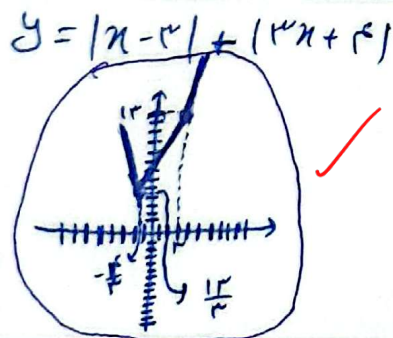
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الف) $y = x^2 + \frac{1}{x^2+3} \Rightarrow y = \left(x^2 + 3 + \frac{1}{x^2+3}\right) - 3$
 $y = x^2 + 3 + \frac{1}{x^2+3} \Rightarrow R_y = \left[3 + \frac{1}{4}, +\infty\right) = \left[\frac{13}{4}, +\infty\right)$

ب) $y = \frac{x^2+4}{x^2+3} = \frac{(x^2+3)+1}{x^2+3} = 1 + \frac{1}{x^2+3}$
 $R_y = \left[1 + \frac{1}{4}, +\infty\right) = \left[\frac{5}{4}, +\infty\right)$ ✓

(2)

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$y = |x-3| + (3x+4) \rightarrow$
 $-x+3-3x+4 = -4x+7$
 $x-3+3x+4 = 4x+1$

$R_y = \left[\frac{7}{4}, +\infty\right) \quad D_y = \mathbb{R}$

(2)

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الف) $y = |x-2| + |2x+2| \rightarrow$
 $-x+2-2x-2 = -3x$
 $-x+2+2x+2 = x+4$
 $x-2+2x+2 = 3x$
 $R_y = [3, +\infty)$ ✓

(2)

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ب) $y = |2x-2| - (x+1) \rightarrow$
 $-x+1-x-1 = -2x$
 $-x+1+x+1 = 2$
 $x-2-x-1 = -x-3$

$R_y = [-2, +\infty)$ ✓

(2)