



آبازار کربیم زاده - اوازدهم روضه - عظیم ۴

$$f(-x) - x f(x) = 2|x| + 1 \xrightarrow{x \rightarrow -x} -x^r f(x) + f(-x) = |x| + x \quad (\text{سوال ۱})$$

$$f(x) + x f(-x) = 2|x| + 1 \quad \begin{cases} -f(x) - f(-x) = -2|x| - 1 \end{cases}$$

$$(-x^r - 1)f(x) = |x| + x - 2|x| - 1$$

$$f(x) = \frac{|x| + x - 2|x| - 1}{-x^r - 1}$$

$$f(x) = \begin{cases} \frac{|x|^r - x - 1}{-x^r - 1} & ? x \geq 0 \\ \frac{-|x|^r + |x| - 1}{-x^r - 1} & ? x \leq 0 \end{cases}$$

$$f(x) + f(0) = x^r - |x|^r + 1 \xrightarrow{x=0} 1f(0) = 1 \rightarrow f(0) = 1 \quad (\text{سوال ۲})$$

$$f(x^r) = x^r - |x|^r + 1$$

$$y = \frac{x^r + x + 1}{x - 1} \rightarrow yx - y = x^r + x + 1 \rightarrow x^r + (1 - y)x + 1 + y = 0 \quad (\text{سوال ۳})$$

$$\Delta \geq 0 \rightarrow (1 - y)^r - 4(1 + y) \geq 0$$

$$\rightarrow y^r + 1 - 4y - 4y - 4 \geq 0 \rightarrow y^r - 8y - 3 \geq 0 \rightarrow (y - 3)(y + 1) \geq 0 \quad \begin{matrix} -1 & 3 \\ + & - & + \\ 6 & 0 \end{matrix}$$

$$Ry = 1R - (-1, 3)$$



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الف) $y = \sqrt{x^2 - 6x + 1}$ $a > 0$ $\min \left| \frac{-b}{2a} = \frac{0}{2} \right|$ $\frac{-14}{1}$ $Ry = \left[-\frac{14}{1}, +\infty \right)$ (ف)ب

ب) $y = \sqrt{-(x-3)^2 + 4} = \sqrt{(-\infty, 4]} \rightarrow [0, 2]$ $Ry = [0, 2]$

ج) $y = \sqrt{x^2 - 2x + 1} = \sqrt{(-\infty, +\infty)} = [0, +\infty) \rightarrow Ry = [0, +\infty)$

د) $\log(x^2 - 4x + 1) > 0 \rightarrow \log(0, +\infty) = (-\infty, +\infty) \rightarrow Ry = \mathbb{R}$

الف) $y = \frac{1}{x-4} \rightarrow Ry = \mathbb{R} - \left\{ \frac{1}{4} \right\}$ $y = \frac{ax+b}{cx+d}$ (ف)ب
 $\hookrightarrow Ry = \mathbb{R} - \left\{ \frac{a}{c} \right\}$

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

ج) $y = \frac{x^2+4}{\sqrt{x^2+4}} \rightarrow \sqrt{x^2+4} + \frac{1}{\sqrt{x^2+4}} \rightarrow \min = \sqrt{4} \rightarrow Ry = \left[\sqrt{4} + \frac{1}{\sqrt{4}}, +\infty \right)$

د) $y = x^2 + 4 + \frac{1}{x^2+4} - 4 \rightarrow Ry = \left[\frac{1}{4}, +\infty \right)$
 $(x^2+4) \rightarrow \min = 4$

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$$y = \frac{x^2 + 4}{x^2 - 1}$$

اصل $\rightarrow yx^2 - y = x^2 + 4 \rightarrow x^2 = \frac{y+4}{y-1} \rightarrow \frac{-4}{1} \frac{1}{0} \rightarrow R_y = \mathbb{R} - (-4, 1]$

حد $\rightarrow y = \frac{x^2 + 4}{x^2 - 1} \rightarrow 0 < x^2 < +\infty \rightarrow -4 \sim \frac{-4}{1} \rightarrow R_y = \mathbb{R} - (-4, 1]$

$f(x) = \frac{1 \sin x + 4}{\sin x - 1} \rightarrow -1 \leq \sin x \leq 1 \rightarrow \frac{1+4}{-1} = -5 \sim \frac{-1+4}{-1} = -\frac{3}{1}$
 $\rightarrow R_y = [-\frac{3}{1}, -5]$

الف) $y = \left| \frac{x^2 - 1}{x} \right| \rightarrow \mathbb{R} - \left\{ \frac{1}{x} \right\} \rightarrow [0, \frac{1}{x}]$
 $R_y = [0, +\infty) - \left\{ \frac{1}{x} \right\}$

ب) $y = \sqrt{\frac{9(x-1)}{4(x-1)}} = \sqrt{\frac{9}{4}} = \frac{3}{2} \rightarrow R_y = \left\{ \frac{3}{2} \right\}$

$y = \begin{cases} x^2 - 1 & x \geq 0 \\ -x^2 - 1 & x \leq 0 \end{cases} \rightarrow R_y = \mathbb{R}$

$y = |f(|x|) + 1| \rightarrow$