

$$y = \frac{x^2}{x^2-1} + f \rightarrow x^2 = \frac{-y-f}{y-3} = \frac{y+f}{y-3} \quad (2)$$

$$\rightarrow x = \pm \sqrt{\frac{y+f}{y-3}} \rightarrow \frac{y+f}{y-3} \geq 0 \quad \begin{matrix} -f & 3 \\ + & - & + \\ & 0 & \end{matrix}$$

$$R_f = (-\infty, -f] \cup (3, +\infty) \quad \checkmark$$

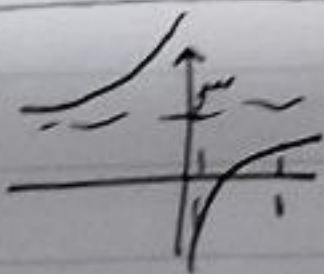
$$D = x^2 \rightarrow \begin{cases} x^2 = 0 \rightarrow y = -f \\ x^2 \rightarrow \infty \rightarrow y = 3 \end{cases} \xrightarrow[\text{طفر بشود}]{\text{مفرد می تواند}} R_y = (-\infty, -f] \cup (3, +\infty)$$

$$y = \frac{2 \sin x + f}{\sin x - 3} \xrightarrow{\sin x = -1} \frac{-2 + f}{-1 - 3} = \frac{2}{-4} = -\frac{1}{2} \quad (2) \quad \checkmark$$

$$\xrightarrow{\sin x = 1} \frac{2 + f}{1 - 3} = \frac{6}{-2} = -3$$

$$R_f = [-3, -\frac{1}{2}] \quad \leftarrow \text{مفرد هم نمی تواند افقرد باشد (افقرد و منفرد)}$$

$$y = \left| \frac{3x-1}{3x} \right|$$



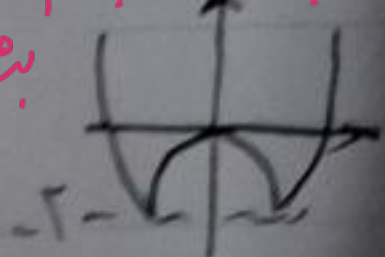
$$x=0: \text{مجاانب قائم} \quad (2) \quad \checkmark$$

$$y = \frac{3}{3} = 1: \text{مجاانب افق}$$

$$R_f = [\frac{2}{3}, +\infty)$$

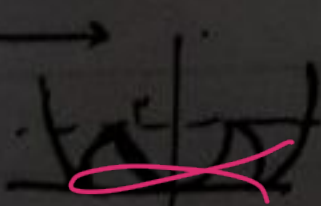
$$y = \sqrt{\frac{9x-18}{3x-1}} = \sqrt{\frac{9(x-2)}{3(x-\frac{1}{3})}} = \sqrt{\frac{9}{3}} = \frac{3}{2} \rightarrow R_f = \{\frac{3}{2}\} \quad \checkmark$$

در حله به مرحله پیش تابه بتوغم بخذه
بهم

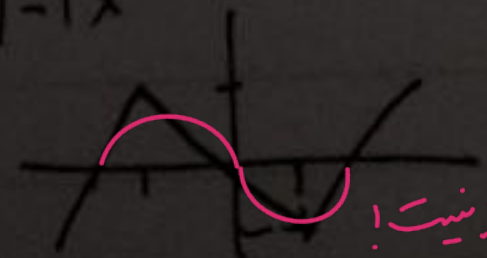


$$f(x)$$

$$y = |x| - 2x$$



$$y = x|x| - 2x$$



$$R_f = \mathbb{R} \quad \checkmark$$

• dotnote $y = |f(x) + 1|$

$$R_f = \mathbb{R} \quad \checkmark$$

$$R_f = (\infty - V) \left[\frac{1}{V} \right]_{V \rightarrow \infty}$$

$$\rightarrow y^r - y + 1 - y^r - y - V \geq 0 \rightarrow y^r - y - y^r - y - V \geq 0$$

$$\rightarrow x = \frac{y - 1 + \sqrt{(1-y)^2 + 4(y+r)}}{2} \rightarrow (y-1)^2 - 4(y+r) \geq 0$$

(1)

$$y = \frac{x-1}{x^r + x + r} \rightarrow yx - y = x^r + x + r$$

$$f(x) = x^r \rightarrow f(x^r) = x^r - x^r + r$$

$$f(x) + r = x^r - x^r + y \rightarrow f(x) = x^r - x^r + r$$

(2)

$$f(x) + f(0) = x^r - x^r = 0 \rightarrow f(0) = 0$$

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

$$(x^r + 1) + (-x) = x^r + x + 1 \rightarrow f(-x) = x^r + x + 1$$

معمولاً در تابع اولی از نم نبود در دومی

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

$$f(-x) - x + f(x) = x^r + 1 \rightarrow f(x) - x + f(x) = x^r + 1$$

(1)

$$|x| = x < x^r$$

برای رفته

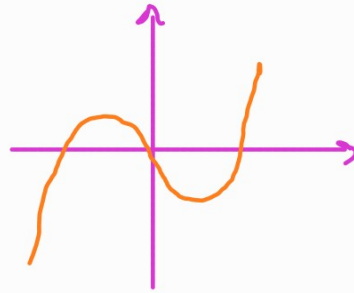
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۱- بجای x و $-x$ قرار می دهیم و یک دستگاه معادلات می یابیم:

$$\begin{aligned} f(-x) - xf(x) &= 2|x| + 1 \xrightarrow{\times x} \begin{cases} xf(-x) - x^2 f(x) = 2x|x| + x & (I) \\ f(x) + xf(-x) = 2|x| + 1 & (II) \end{cases} \\ f(x) + xf(-x) &= 2|x| + 1 \end{aligned}$$

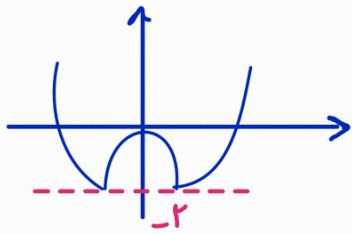
$$\underline{II - I} \rightarrow (1 + x^2) f(x) = 2(1 - x)|x| + 1 - x \Rightarrow f(x) = \frac{(1 - x)(2|x| + 1)}{1 + x^2}$$

$$y = \begin{cases} x^2 - 2x & x \geq 0 \\ -x^2 - 2x & x < 0 \end{cases}$$

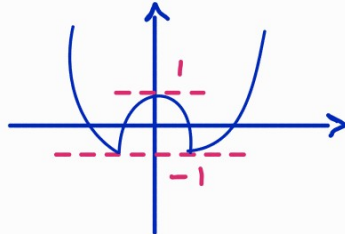


$$\Rightarrow R_y = \mathbb{R}$$

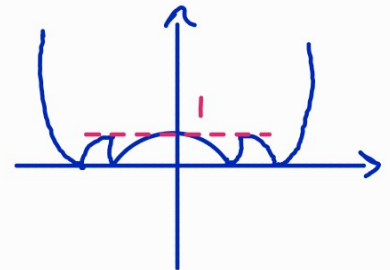
۹



$$y = f(1-x)$$



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



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

۱۰