

$$1) f(-x) - xf(x) = 2|x| + 1 \rightarrow f(x) = ?$$

19, 2

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$$f(x) + xf(-x) = 2|x| + 1$$

$$f(-x) - xf(x) = 2|x| + 1 \rightarrow f(-x) = 2|x| + 1 + xf(x)$$

$$f(x) + xf(-x) = 2|x| + 1 \rightarrow f(x) + x(2|x| + 1 + xf(x)) = 2|x| + 1$$

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

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

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

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

$$2) f(x) + f(-x) = x^2 - 3x + 4 \rightarrow f(x^2) = ?$$

$$x = 0 \rightarrow f(0) = 0 - 0 + 4 = 4 \rightarrow f(0) = 4$$

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$$f(x) + 4 = x^2 - 3x + 4 \rightarrow f(x) = x^2 - 3x + 4 \rightarrow f(x^2) = (x^2)^2 - 3(x^2) + 4$$

$$\rightarrow f(x^2) = x^4 - 3x^2 + 4$$

$$3) R_f = ? \quad y = \frac{x^2 + x + 2}{x-1}$$

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$$y(x-1) = x^2 + x + 2 \rightarrow xy - y = x^2 + x + 2$$

$$x^2 + x - xy + y + 2 = 0 \rightarrow x^2 + (1-y)x + (y+2) = 0 \xrightarrow{\Delta \geq 0} (1-y)^2 - 4(1)(y+2) \geq 0$$

$$\frac{-1 \pm \sqrt{1-4}}{2} = \frac{-1 \pm \sqrt{-3}}{2}$$

$$R = (-\infty, -1] \cup [1, +\infty)$$

$$1 - 4y + y^2 - 4y - 8 \geq 0$$

$$y^2 - 4y - 7 \geq 0 \rightarrow (y-7)(y+1) \geq 0$$

$$4) \text{ a) } y = \frac{x^2 - 2x + 1}{x^2 + 4x - 4} \rightarrow \frac{\Delta}{f} \rightarrow y = \frac{2}{x^2 + 4x - 4} - 2\left(\frac{2}{x^2 + 4x - 4}\right) + 1 = -\frac{1}{x}$$

$$\rightarrow y = \sqrt{-x^2 + 4x - 4} \rightarrow -(-x^2 - 4x + 4) \xrightarrow{\Delta \geq 0} (x-3)^2 - 4 \leq 0 \rightarrow -(x-3)^2 \geq 0$$

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

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

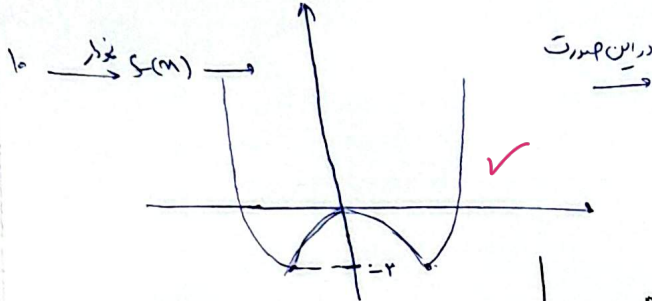
9) $y = x/|x| - 2x \rightarrow R_f = ?$ $\min = -1$

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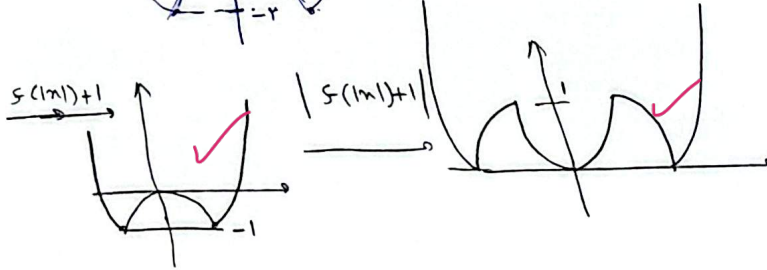
$\rightarrow x \geq 0 \rightarrow |x| = x \rightarrow y = x^2 - 2x \xrightarrow{\text{در این قسمت}} (x-1)^2 - 1 = y \rightarrow [-1, +\infty)$

$\rightarrow x \leq 0 \rightarrow |x| = -x \rightarrow y = -x^2 - 2x \Rightarrow y = -(x+1)^2 + 1 \xrightarrow{x = -1 \rightarrow y = -\frac{1}{4} + 1 = \frac{3}{4}} (-\infty, 1]$

$U \rightarrow R$



در این قسمت $\rightarrow y = |f(|x|) + 1|$ (2)



$$2) y = \frac{r^2 + 1}{r^2 - 4} \quad R_f = R - \left\{ \frac{r}{f} \right\}$$

(1, V5)

$$3) \sqrt{\frac{\varepsilon n + 1}{n - r}} \rightarrow R = \left\{ \frac{r}{f} \right\}$$

$$\begin{aligned} y^2(n-r) &= \varepsilon n + 1 \rightarrow ny^2 - ry^2 = \varepsilon n + 1 \\ ny^2 - \varepsilon n &= ry^2 + 1 \rightarrow n(y^2 - r) = ry^2 + 1 \rightarrow n = \frac{ry^2 + 1}{y^2 - r} \\ y^2 - r &\neq 0 \rightarrow y \neq \sqrt{r} \rightarrow y \neq 2, \text{ (2)} \rightarrow y > 0 \end{aligned}$$

$$4) S \left| \frac{r}{f} \right. \rightarrow R_y = \sqrt{[-\infty, r]} = [0, r]$$

$$2) y = \frac{r^2 + f}{\sqrt{r^2 + r}} = \frac{r^2 + r}{\sqrt{r^2 + r}} + \frac{1}{\sqrt{r^2 + r}} = \sqrt{r^2 + r} + \frac{1}{\sqrt{r^2 + r}} \xrightarrow{\text{نقطة}} \sqrt{r} + \frac{1}{\sqrt{r}} \rightarrow \left[\frac{\varepsilon}{\sqrt{r}}, +\infty \right)$$

$$3) = \frac{r^2 + 1}{r^2 + f} \rightarrow r^2 = A \rightarrow y = A + \frac{1}{A + \varepsilon} \rightarrow S(0) = \frac{1}{\varepsilon} \rightarrow y - \frac{1}{2} = A + \frac{1}{A + \varepsilon} - \frac{1}{\varepsilon}$$

$$\frac{fA(A+f) + f - (A+\varepsilon)}{f(A+f)} = \frac{fA^2 + fA - A - \varepsilon A}{f(A+f)} = \frac{fA^2 + fA - A - \varepsilon A}{f(A+f)} \xrightarrow{A > 0} \frac{A(fA + f - 1 - \varepsilon)}{f(A+f)} \xrightarrow{\varepsilon A + f > 0} \frac{A(fA + f - 1 - \varepsilon)}{f(A+f)} > 0$$

$$y - \frac{1}{\varepsilon} > 0 \rightarrow y > \frac{1}{\varepsilon} \rightarrow \left[\frac{1}{\varepsilon}, +\infty \right)$$

$$\begin{aligned} 4) \frac{r^2 + f}{r^2 - 1} &\rightarrow r^2 - y = r^2 + f \rightarrow y = r^2 + f + 1 \rightarrow r^2 = \frac{y + \varepsilon}{y + f} \rightarrow r = \pm \sqrt{\frac{y + \varepsilon}{y + f}} \\ R_f &= (-\infty, -\varepsilon] \cup (\varepsilon, +\infty) \\ \text{نقطة} &\rightarrow y = 1 \rightarrow r = 1 \\ \text{نقطة} &\rightarrow y = -f \Rightarrow R_f = R - \left\{ \frac{r}{f} \right\} \end{aligned}$$

(1, V5)

$$5) f(n) = \frac{-1 < A < 1}{r^2 \sin n + f} \rightarrow \frac{rA + \varepsilon}{A - r} \xrightarrow{yA - ry = rA + \varepsilon} yA - rA = ry + \varepsilon \rightarrow yA - rA = ry + \varepsilon \rightarrow A = \frac{ry + \varepsilon}{y - r} \rightarrow -1 \leq \frac{ry + \varepsilon}{y - r} \leq 1$$

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$$\begin{aligned} \frac{ry + \varepsilon}{y - r} > -1 &\rightarrow \frac{ry + \varepsilon + y - r}{y - r} > 0 \rightarrow \frac{\varepsilon y + r}{y - r} > 0 \rightarrow \frac{ry + 1}{y - r} > 0 \rightarrow \frac{-\frac{1}{r}}{+\frac{1}{r} - 1} \\ \frac{ry + \varepsilon}{y - r} < 1 &\rightarrow \frac{ry + \varepsilon - y + r}{y - r} < 0 \rightarrow \frac{ry + r}{y - r} < 0 \rightarrow \frac{y + r}{y - r} < 0 \rightarrow \frac{+\frac{1}{r}}{+\frac{1}{r} - 1} \end{aligned} \Rightarrow n \Rightarrow \left[-\frac{1}{r}, -\frac{1}{r} \right]$$

$$6) \text{ ان } y = \left| \frac{r^2 - 1}{r^2} \right| \quad \begin{aligned} rny &= r^2 - 1 \\ rny - r^2 &= -1 \rightarrow n(\varepsilon y - r) = -1 \rightarrow n = \frac{-1}{\varepsilon y - r} \end{aligned} \rightarrow \varepsilon y - r \neq 0 \rightarrow y \neq \frac{r}{\varepsilon} \rightarrow y = R - \left\{ \frac{r}{\varepsilon} \right\}$$

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$$\text{نقطة} \rightarrow [0, +\infty)$$

$$7) y = \sqrt{\frac{an - 1n}{-1 + kn}} \rightarrow \sqrt{\frac{a(n-r)}{1 + (n-r)}} \rightarrow \sqrt{\frac{a}{2}} = \frac{r}{f} \rightarrow R = \left\{ \frac{r}{f} \right\}$$