

کلیلاً فرضینا

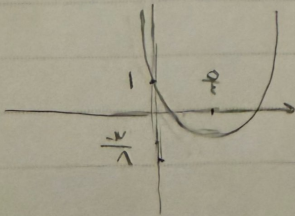
$$1. \quad y = \frac{x^2 + x + 2}{x+1} \rightarrow y(x+1) = x^2 + x + 2 \rightarrow x^2 + x + 2 - yx - y = 0$$

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

$$y^2 - 4y - 7 = (y+1)(y-7) \geq 0 \rightarrow y \in (-\infty, -1] \cup [7, +\infty)$$

$$2. \quad y = \frac{x^2 - 5x + 1}{x+1}$$

$$\rightarrow \frac{-b}{2a} = \frac{0}{2} = 0 \sim x_{ext} \rightarrow \frac{0^2}{14} - \frac{1 \cdot 0}{14} + \frac{14}{14} = \frac{-14}{14} = -1 \sim y_{ext}$$



$$R_f = [-1, +\infty)$$

$$3. \quad \sqrt{x^2 + 4x - 5} \sim \frac{-5}{2x} \sim \frac{-(x_2 - x_1)}{-x} \sim x \sim x \in (-\infty, 4]$$

$$R_f = [0, 4]$$

$$4. \quad y = \sqrt{x^2 - 3x + 2}$$

برای اینکه تابع از مرتبه اول، باید $1R$ و $1R$ باشد
 عبارت زیر رادیکال است $\rightarrow R_f = [0, +\infty)$

$$5. \quad \log(x^2 - 4x + 7)$$

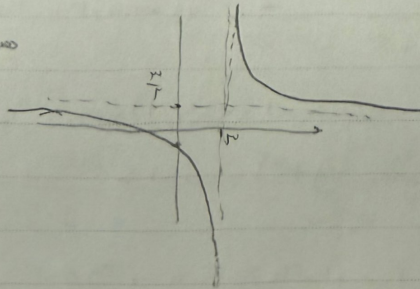
شرط $(0, +\infty)$ دارد

برای هر $x \in \mathbb{R}$

$$\rightarrow R_f = (-\infty, +\infty) \sim \mathbb{R}$$

$$y = \frac{n+1}{n-4} \quad \text{معرکز افقی}$$

معر



معرکز افقی و عمودی

$$\frac{c}{a} = \frac{p}{n}$$

$$R \neq \{R - \{p\}\}$$

$$y = \sqrt{\frac{n+1}{n-4}}$$

$$R - \{4\} \quad \text{نقطه افقی} \quad \frac{c}{a} = 4 \quad \text{نقطه افقی} \quad [0, +\infty) - \{4\}$$

$$y = \frac{n^2+2}{\sqrt{n^2+3}} \quad \begin{matrix} \nearrow +\infty \\ \searrow +\infty \end{matrix} \quad \frac{4}{\sqrt{3}} \rightarrow \frac{4\sqrt{3}}{3} \quad R_f = \left[\frac{4\sqrt{3}}{3}, +\infty \right)$$

نقطه افقی

$$y = n^2 + \frac{1}{n^2+4} \quad \begin{matrix} \nearrow 0 \\ \searrow +\infty \end{matrix} \quad \frac{1}{4} \rightarrow R_f = \left[\frac{1}{4}, +\infty \right)$$

نقطه افقی

$$y = \frac{n^2+2}{n^2-1} \quad \begin{matrix} \nearrow +\infty \\ \searrow -\infty \end{matrix} \quad \text{نقطه افقی} \quad R_f = (-\infty, -1] \cup (1, +\infty)$$

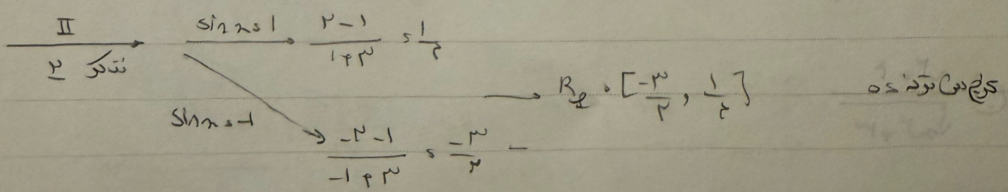
$$y = \frac{P \sin \alpha - 1}{\sin \alpha + P} \xrightarrow{\text{نضرب الطرفين}} y(\sin \alpha + P) = P \sin \alpha - 1 \quad \text{... 5}$$

$$y \sin \alpha + P y = P \sin \alpha - 1 \rightarrow (y - P) \sin \alpha = -1 - P y$$

$$\sin \alpha = \frac{-1 - P y}{y - P} \quad (y \neq P) \rightarrow -1 \leq \frac{-1 - P y}{y - P} \leq 1 \sim y \neq P$$

$$\frac{-1 - P y}{y - P} \geq -1 \rightarrow -1 - P y \geq P y - 1 \rightarrow P y \leq P \rightarrow y \leq \frac{P}{P} = 1$$

$$\frac{-1 - P y}{y - P} \leq 1 \rightarrow -1 - P y \leq y - P \rightarrow P y \leq y - 1 \rightarrow y \geq \frac{1}{1 - P} \rightarrow R_f = \left[\frac{1}{1 - P}, 1 \right]$$



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$$f(x) = \frac{x^2 - x + \frac{1}{x}}{x^2 - x + 1} \sim (x, \sqrt{1 - x}) \times \rightarrow \text{مجال التعريف} \rightarrow D_f = \mathbb{R}$$

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

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

$$1 - y \neq 0 \rightarrow y \neq 1 \rightarrow (y - 1)(y - 1 + 4y) = 0 \rightarrow y(y - 1) = 0$$

$$y = 0 \text{ or } y = 1$$

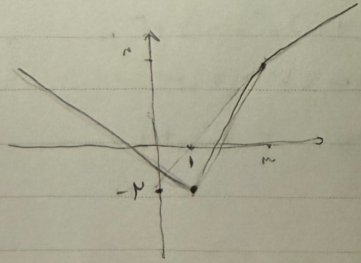
$$R_f = [0, 1)$$

الف)

$$y = |x-1| + |x-3|$$

$$\begin{array}{ccc} & 1 & 3 \\ -x+1+x-3 & x-1+x-3 & x-1-x+3 \\ -x-1 & 2x-4 & -x+2 \end{array}$$

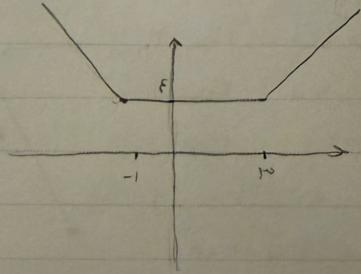
$$R_f = [-1, +\infty)$$



$$ب) y = |x-1| + |x+1|$$

$$\begin{array}{ccc} & -1 & 1 \\ -x+1-x-1 & -x+1+x+1 & x-1+x+1 \\ -x-1 & 2 & x-1 \end{array}$$

$$R_f = [1, +\infty)$$



$$|x-1| - |x+1| \leq 1$$

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$$\begin{array}{ccc} & -1 & 1 \\ -x+1-x-1 & -x+1-x-1 & x-1-x-1 \\ x+1 \leq 1 & -x \leq 1 & -x-1 \leq 1 \\ x \leq -1 & x \geq -1 & -x \leq 0 \\ & x \geq -\frac{1}{x} & x \geq -0 \checkmark \end{array}$$

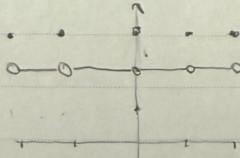
$$\rightarrow R_f = (-\infty, -1] \cup [-\frac{1}{x}, +\infty)$$

الف) $[x] + [x - n]$

$[x] + [x - n] = n$

$x \in \mathbb{Z} \rightarrow n (0, n)$

$x \in \mathbb{Z} \rightarrow n (-1, n)$



$R_f = \{n, n\}$

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ب) $y = [x] - [x]$

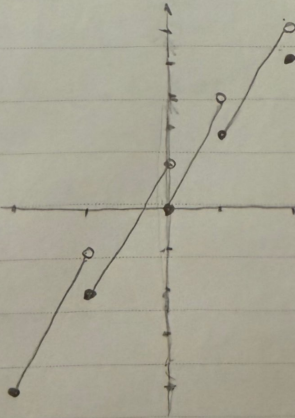
$-1 \leq x < 0 \rightarrow [x] = -1$

$0 \leq x < 1 \rightarrow [x] = 0$

$1 \leq x < 2 \rightarrow [x] = 1$

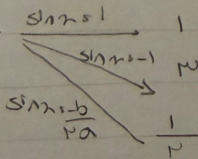
$x = 2 \rightarrow [x] = 2$

$x = 2 \rightarrow y = 2 - 2 = 0$



$R_f = [-1, 0)$

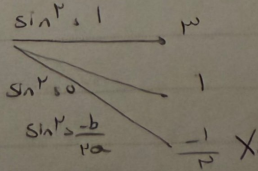
ج) $y = \sin^2 x - \sin x + 1$



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$R_f = [1, 2]$

د) $y = \sin^2 x + \sin x + 1$



$R_f = [1, 2]$