

الف) $y = \frac{|x|+1}{|x|-2} \rightarrow |x|y - 2y = |x|+1 \rightarrow |x|y - |x| = 1+2y \rightarrow |x| = \frac{1+2y}{y-1}$

$\rightarrow \frac{1+2y}{y-1} \geq 0 \rightarrow R_f = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$

ب) $y = \frac{x^2+1}{|x|} = \frac{|x|^2+1}{|x|} = |x| + \frac{1}{|x|} \xrightarrow{|x|>0} R_f = [2, +\infty)$

$y = \frac{x^2+2x-2}{x+3} \rightarrow yx+3y = x^2+2x-2 \rightarrow x^2+x(2-y)-2-3y=0$ ✓ صفحه آخر...

$\Delta \geq 0 \rightarrow 4+y^2-4y+8+12y \geq 0 \rightarrow y^2+8y+12 \geq 0 \xrightarrow{a>0} R_f = (-\infty, -2] \cup [-6, +\infty)$ حسه برقرار

$\rightarrow R_f = \mathbb{R}$ وقت!

دافنه؟
مخرج همواره مثبت $D_f = \mathbb{R}$

D: $x^2-x+1 \neq 0 \xrightarrow{\Delta < 0} D_f = \mathbb{R}$ حسه برقرار هیچ نداد

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

$\Delta \geq 0 \rightarrow 1-2y+y^2-4y^2+4y-1 \geq 0 \rightarrow 3y^2-2y \leq 0 \rightarrow y(3y-2) \leq 0$

$\left. \begin{array}{l} x^2-x+\frac{1}{x}=0 \rightarrow x=\frac{1}{x} \\ x^2-x+\frac{1}{x}=x^2-x+1 \rightarrow \text{جواب ندارد} \end{array} \right\} \rightarrow R_f = [0, \frac{2}{3}]$

الف) $y = \sqrt{-x^2+4x-1} \rightarrow \text{راس} \left| \begin{array}{l} x = \frac{-4 \pm \sqrt{16-4}}{-2} = 2 \\ y = 3 \end{array} \right. R = (-\infty, 3] \cap [0, \sqrt{3}]$

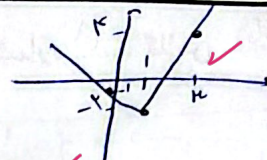
ب) $y = \sqrt{2x^2-12x} \rightarrow \text{راس} \left| \begin{array}{l} \frac{\Delta}{4} = 2 \\ -18 \end{array} \right. R = [-1, +\infty) \cap [-2, +\infty)$

$y = \log(x^2-x+11) \xrightarrow{f(x)=x^2-x+11} R_f = \mathbb{R} \rightarrow y = \log R = \mathbb{R}$

$y = \log \frac{x^2+1}{x} \rightarrow f(x) = \frac{x^2+1}{x} = x + \frac{1}{x} \xrightarrow{\text{دافنه مثبت}} R = [2, +\infty)$

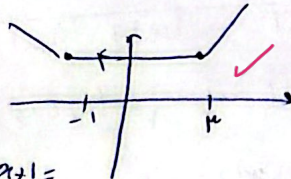
$\rightarrow y \geq \log 2 \rightarrow y \geq 1 \rightarrow R_y = [1, +\infty)$

$$y = \left| \frac{r_x - r}{x - r} \right| = \left| \frac{r_x - r}{x - r} \cdot \frac{r_x + r}{r_x + r} \right| = \left| \frac{r_x^2 - r^2}{(x - r)(r_x + r)} \right|$$



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

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



$$R = [K, \varphi]$$

$$\begin{pmatrix} x-1-x \\ -x+x \end{pmatrix} = \begin{pmatrix} 1+x \\ x-x \end{pmatrix}$$

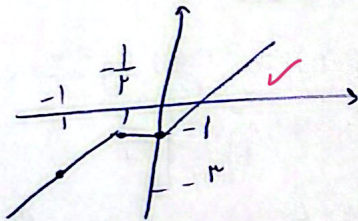
$$\begin{array}{l|l} \begin{array}{l} y-x+y(x+y)= \\ x+y \\ x+z \leq 1 \\ x \leq -y \\ x \leq -y \wedge x \leq -1 = \\ \boxed{x \leq -1} \end{array} & \begin{array}{l} y-x-y(x-y)= \\ -yx \\ -yx \leq 1 \\ x \leq -\frac{1}{y} \\ x \leq -\frac{1}{y} \wedge -1 \leq x \leq 1 \\ \boxed{-\frac{1}{y} \leq x \leq 1} \end{array} \end{array} \quad \begin{array}{l} x-y-y(x-y)= \\ -x-y \\ -x-y \leq 1 \\ -x \leq 1+y \\ \omega \leq 1+y \\ x \geq 1+y \end{array}$$

$-x - 1 \leq 1$
 $x \leq 2$ ✓
 $-2 \leq x$
 $x \geq -2$
 $x \geq -2$

$$\rightarrow U \rightarrow V \text{ ****} = (-\infty, -1] \cup [-\frac{1}{e}, +\infty)$$

$$y = \ddot{r}x - (r\ddot{x} + 1) + |x|$$

$$c) \quad \begin{matrix} \psi_{2x} + \psi_{2x+1} - x = \\ \psi_{2x+1} \end{matrix} \quad \left| \begin{matrix} \psi_{2x} - \psi_{2x-1} \\ -x = \\ -1 \end{matrix} \right| \quad \begin{matrix} \psi_{2x} - \psi_{2x-1} + x = \\ \psi_{2x-1} \end{matrix}$$



$$R_y = 1R$$

الف) $y = \{x\}, \{x\} + 1$

$x \in \mathbb{Z} \rightarrow y = 0 + 1 = 1$

$x \notin \mathbb{Z} \rightarrow y = -1 + 1 = 0$

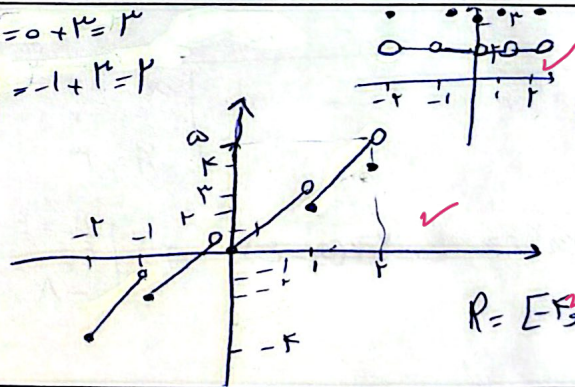
ب) $y = 3x - [x]$

$y = 1x - 2$
 $-2 \leq x < -1 \rightarrow [x] = -1 \quad y = 1x + 1$

$$-1 \leq 2x < 0 \rightarrow \{x\} = -1 \quad y = \frac{1}{2}x + 1$$

$$0 \leq x < 1 \rightarrow [x] = 0 \quad y = \frac{1}{2}x$$

$$1 \leq x < 2 \rightarrow [x] = 1 \quad y = 3x - 1$$



$$R = \{15, 17\}$$

$$R = E \cdot F_{\omega}$$

$$y = \sin^2 x - \sin x + 1$$

$$\sin x = -1 \rightarrow y = \pi$$

$$\sin x = 1 \rightarrow y = 1$$

$$\sin \alpha = \frac{-b}{Pa} = \frac{1}{\gamma} \rightarrow y = \frac{\mu}{\epsilon}$$

$$R = \left[\frac{\mu}{\varepsilon} \right]$$

$$y = \sin^6 x + \sin^7 x + 1$$

$$\sin^2 x = -1 \quad x$$

$$\sin^2 x = 0 \rightarrow y = 1$$

$$\sin^2 x = -\frac{1}{r} \propto$$

$$\sin^2 x = 1 \rightarrow y = 1^2$$

$$R = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

۳- مخرج کسر همواره مثبت است پس دامنه IR است

$$f(n) = \frac{(n - \frac{1}{r})^2}{(n - \frac{1}{r})^2 + \frac{r}{4}}$$

طرفین درمیان $\rightarrow yn^2 - yn + y = n^2 - n + \frac{1}{r} \rightarrow (y-1)n^2 - (y-1)n + y - \frac{1}{r} = 0$

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

$$\frac{0}{-} \mid \frac{1}{+} \Rightarrow y = [0, 1]$$

ضریب n نباید منفی شود یعنی $y \neq 1$ است

و تابع در انزای هیچ مقداری برابر همیشه پس برد برابر است با: $R_y = [0, 1)$

می‌توانست از روش مربع هم استفاده کنیم

$$f(n) = \frac{\square^2}{\square^2 + \frac{r}{4}}$$