

سوال ۱

الف) $y = \frac{|x|+1}{|x|-2}$ $\xrightarrow{\text{مقلوب}}$ $|x| = -\frac{y-1}{y+1} = \frac{y+1}{y-1}$ $\frac{y+1}{y-1} \geq 0 \rightarrow \frac{0}{+ \quad - \quad - \quad +}$

$\Rightarrow R = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$

ب) $y = \frac{x^2+1}{|x|}$ $\rightarrow \frac{0}{-x-\frac{1}{x} \quad 0 \quad x+\frac{1}{x}}$ $\begin{cases} -x-\frac{1}{x} \rightarrow x < 0 \rightarrow -(x+\frac{1}{x}) \rightarrow (-\infty, -2] \xrightarrow{x \rightarrow 0^+} [2, +\infty) \\ x+\frac{1}{x} \rightarrow x > 0 \rightarrow [2, +\infty) \end{cases}$

$\Rightarrow R = [2, +\infty)$

$y = \frac{x^2+2x-2}{x+3} \rightarrow y = \frac{(x+3)(x-1)+1}{x+3} = x-1 + \frac{1}{x+3} = x+3 + \frac{1}{x+3} - 4$

سوال ۲

$\rightarrow R = (-\infty, -2] \cup [2, +\infty) \Rightarrow R = (-\infty, -2] \cup [-2, +\infty)$

سوال ۳ $f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} = \frac{(x-\frac{1}{x})^2}{x^2-x+1}$: همواره $\begin{cases} f(x) < 1 \text{ : صورت } < \text{ مخرج} \\ f(x) = 0 \text{ : } x = \frac{1}{x} \rightarrow f(x) = 0 \text{ : صورت خارج همواره مثبت است} \\ f(x) > 0 \end{cases} \Rightarrow f(x) > 0$

$\Rightarrow R = [0, 1)$ $x^2-x+1 \neq 0 \rightarrow D = R$

سوال ۴

الف) $y = \sqrt{-x^2+4x-1}$ $\begin{cases} -\frac{b}{2a} = \frac{2}{-1} = -2 \\ \frac{b^2-4ac}{4a} = \frac{4-4(-1)}{4} = 2 \end{cases}$ $\Rightarrow R = [0, \sqrt{3}]$

ب) $y = \sqrt[3]{2x^2-4x}$ $\begin{cases} -\frac{b}{2a} = \frac{2}{1} = 2 \\ \frac{b^2-4ac}{4a} = \frac{4-0}{4} = 1 \end{cases}$ $\rightarrow [-1, +\infty) \xrightarrow{\sqrt[3]{}} R = [-2, +\infty)$

سوال ۵

الف) $y = \log(x^2-x+1)$ $\xrightarrow{\text{دارای بیشترین توان فرد}} R = \mathbb{R} \xrightarrow{\log(\cdot)} \mathbb{R}$

ب) $y = \log_2\left(\frac{x^2+1}{x}\right)$ $\xrightarrow{n+\frac{1}{n} \text{ (در } \log \text{ است پس } y \text{ همواره مثبت باشد)}} R = [2, +\infty) \xrightarrow{\log(\cdot)} [1, +\infty)$

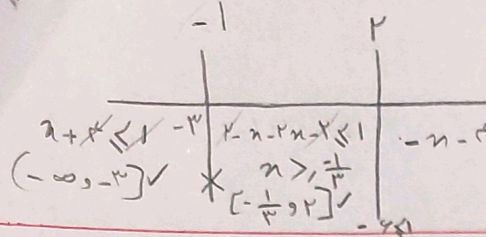
سوال ۶

الف) $y = |2x-2| - |x-3|$ $\begin{matrix} -2 & 2 \\ -x-1 & 1 \\ 3 & x+1 \end{matrix}$ $\Rightarrow R = [-2, +\infty)$

ب) $y = |x-3| + |x+1|$ $\xrightarrow{\text{تدریجی}} R = [4, +\infty)$

سوال ٧

$$|x-2| - |2x+2| \leq 1$$

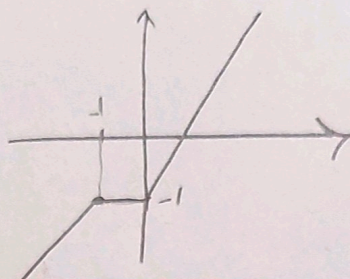
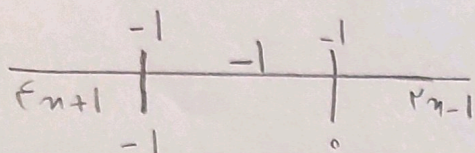


همراهی ببریم

$$(-\infty, 3] \cup [\frac{2}{3}, +\infty)$$

$$2+x \leq 1-3 \quad |x-2|-2x-2 \leq 1 \quad -x-4 \leq 1 \rightarrow x \geq -5 \quad \checkmark$$

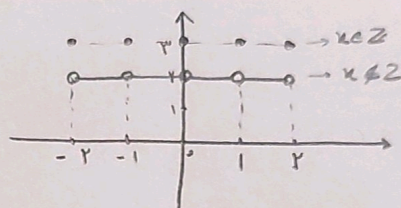
$$y = 3x - |2x+1| + |x|$$



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

سوال ٨

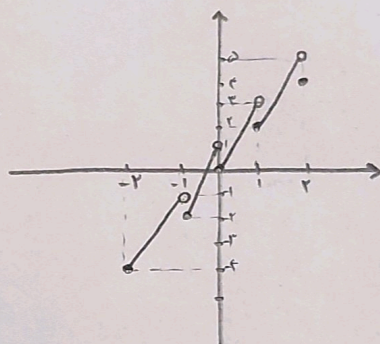
$$الف) y = [x] + [3-x] = 3 + [x] + [-x]$$



سوال ٩ $[-2, 2]$

$$R = \{2, 3\}$$

$$ب) y = 3x - [x] : \begin{aligned} -2 \leq x < -1 &\rightarrow 3x+2 \\ -1 \leq x < 0 &\rightarrow 3x+1 \\ 0 \leq x < 1 &\rightarrow 3x \\ 1 \leq x < 2 &\rightarrow 3x-1 \\ x=2 &\rightarrow f \end{aligned}$$



$$R = [-2, 2]$$

$$الف) y = \sin^2 x - \boxed{\sin x} + 1 : \left\{ \begin{aligned} \max &= 1 \rightarrow 1 - 1 + 1 = 1 \\ \min &= -1 \rightarrow 1 + 1 + 1 = 3 \\ \frac{-b}{2a} &= \frac{1}{2} \rightarrow \frac{1}{4} - \frac{1}{4} + 1 = \frac{3}{4} \end{aligned} \right\} \Rightarrow R = [\frac{3}{4}, 3]$$

$$ب) y = \sin^2 x + \boxed{\sin^2 x} + 1 : \left\{ \begin{aligned} \max &= 1 \rightarrow 3 \\ \min &= 0 \rightarrow 1 \\ \frac{-b}{2a} &= \frac{1}{2} \times \sin^2 x \geq 0 \end{aligned} \right\} \Rightarrow R = [1, 3]$$