

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

(۲) (۱)

$\rightarrow y|x| - |x| = 1+2y \rightarrow |x| = \frac{1+2y}{y-1} \rightarrow |x| \geq 0$

$\rightarrow \frac{-\frac{1}{2}}{+\phi - \frac{1}{2}+} \rightarrow R_y = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$

ب) $y = \frac{x^2+1}{|x|} \rightarrow = \frac{x^2}{|x|} + \frac{1}{|x|} = |x| + \frac{1}{|x|} \rightarrow R_y = [\frac{2}{\sqrt{2}}, +\infty)$

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

(۲) (۲)

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

$\rightarrow y^2+4y+12 \geq 0 \rightarrow (y+4)(y+2) \geq 0$

$R_y = [-\infty, -4] \cup [-2, +\infty)$

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

$\Delta = 1-f = -\frac{1}{x} \rightarrow R_f = \mathbb{R}$

(۲) (۳)

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

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

$\rightarrow y^2+y \geq 0 \rightarrow R_f = [0, 1]$

الف) $y = \sqrt{-x^2+4x-1}$

$\rightarrow \min = 0$

$\rightarrow \max = \sqrt{\frac{\Delta}{a}} = \sqrt{\frac{16-4}{1}} = \sqrt{12}$

(۲) (۴)

$R_y = [0, \sqrt{12}]$

ب) $y = \sqrt[3]{x^2-4x}$

$\rightarrow \max = +\infty$

$\rightarrow \min = \sqrt[3]{-\frac{\Delta}{4a}} = \sqrt[3]{-\frac{4}{1}} = -2$

$R_y = [-2, +\infty)$

(5) (2)

$$y = \log(n^2 - n + 1) \quad \text{الف)}$$

برد چند جمله ای با توان بزرگ مزد ۱۲ است پس در بردار: $(0 + \infty)$ می خواهیم و اگر این در دامنه $\log$ باشد برد برابر $\mathbb{R}$ می شود.

$$\text{ب)} \log_2\left(\frac{n^2+1}{n}\right) = \log_2\left(n + \frac{1}{n}\right)$$

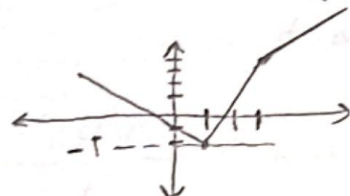
$\downarrow$
بالا تر صفر $\rightarrow [2 + \infty)$

$$\rightarrow \mathbb{R}_y = [2 + \infty) \quad \checkmark$$

61)

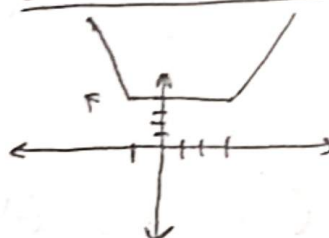
(4) (2)

$$y = |n-2| - |n-3|$$



$$\begin{array}{c} 1 \quad 3 \\ -n-1 \quad 3n-5 \quad n+1 \end{array}$$

$$\mathbb{R}_y = [-2, +\infty) \quad \checkmark$$



$$\text{ب)} y = |n-3| + |n+1|$$

$$\mathbb{R}_y = [4, +\infty) \quad \checkmark$$

$$y = |n-2| - |2n+2| \leq 1 \rightarrow |n-2| - |2n+2| - 1 \leq 0$$

(5) (2)

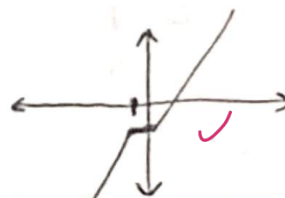
$$\begin{array}{c} -1 \quad 2 \\ n+3 \quad -2n-1 \quad -n-5 \\ \downarrow \quad \downarrow \quad \downarrow \\ n \leq -3 \quad n \geq -\frac{1}{2} \quad n \geq -5 \\ \downarrow \quad \downarrow \quad \downarrow \\ (-\infty, -3] \quad [-\frac{1}{2}, +2] \quad [2, +\infty) \end{array}$$

$$\rightarrow \mathbb{R}_y = (-\infty, -2] \cup [-\frac{1}{2}, +\infty) \quad \checkmark$$

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

$$\begin{array}{c} -\frac{1}{2} \quad 0 \\ 2n+1 \quad -1 \quad 2n-1 \end{array}$$

(7) (2)

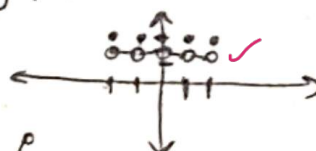


$$\mathbb{R}_y = \mathbb{R} \quad \checkmark$$

$$\text{الف)} y = [n] + [3-n] = [n] + [-n] + 3$$

(9) (2)

$$\mathbb{R}_y = \{1, 2\} \quad \checkmark$$



$$\text{ب)} y = 3n - [n]$$



$$\mathbb{R}_y = [-4, 5) \quad \checkmark$$

الف) $y = \sin^2 x - \sin x + 1$

$$\begin{cases} D_{\max} = 1 \\ D_{\min} = \frac{1}{4} \\ D = -\frac{b}{2a} \rightarrow \frac{1}{4} \end{cases}$$

② (10)

$$R_y = \left[\frac{1}{4}, 1 \right]$$

ب) $y = \sin^2 x + \sin x + 1$

$$\begin{cases} D_{\max} = \frac{5}{4} \\ D_{\min} = 1 \\ D = -\frac{b}{2a} \rightarrow D = -\frac{1}{2} \times \rightarrow D \geq 0 \end{cases}$$

$$\rightarrow R_y = [1, \frac{5}{4}]$$