

$$1. \text{ (الف)} \quad y = \frac{|x|+1}{|x|-2} \Rightarrow |x|+1 = |x|y - 2y \Rightarrow |x|(1-y) = -2y-1 \Rightarrow |x| = \frac{2y+1}{y-1}$$

$$2. |x| \geq 0 \Rightarrow \frac{2y+1}{y-1} \geq 0 \Rightarrow \frac{-1}{y-1} \geq 0 \Rightarrow R = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$$

$$4. \text{ (ب)} \quad y = \frac{x^2+1}{|x|} = |x| + \frac{1}{|x|} \Rightarrow |x| \geq 0 \Rightarrow R = [2, +\infty)$$

$$6. y = \frac{x^2+2x-2}{x+3} \Rightarrow x^2+2x-2 = xy+3y \Rightarrow x^2+(2-y)x-(2+3y) = 0$$

$$\Rightarrow x = \frac{-(2-y) \pm \sqrt{(2-y)^2 + 4(2+3y)}}{2} \Rightarrow (2-y)^2 + 4(2+3y) \geq 0$$

$$\Rightarrow y^2 - 4y + 4 + 12y + 8 \geq 0 \Rightarrow y^2 + 8y + 12 \geq 0 \Rightarrow (y+2)(y+4) \geq 0 \Rightarrow R = (-\infty, -4] \cup [-2, +\infty)$$

$$11. f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} \quad D: x^2-x+1 \neq 0 \Rightarrow \Delta < 0 \Rightarrow \text{همیشه مثبت} \Rightarrow D = \mathbb{R}$$

$$12. \min(x - \frac{1}{x})^2 = 0 \Rightarrow f(x) = \frac{0}{\frac{1}{x}} = 0$$

$$13. R: f(x) = (x - \frac{1}{x})^2 \Rightarrow \min(x - \frac{1}{x})^2 = 0 \Rightarrow f(x) = 0$$

$$15. \text{ (الف)} \quad y = \sqrt{-x^2+4x-1} \Rightarrow \text{ext} = \left| \frac{-b}{2a} = \frac{-4}{-2} = 2 \Rightarrow R = \sqrt{(-\infty, 3]} = [0, \sqrt{3}]$$

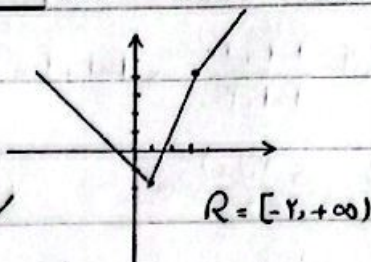
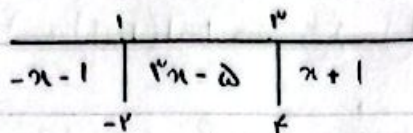
$$17. \text{ (ب)} \quad y = \sqrt[3]{x^2-12x} \Rightarrow \text{ext} = \left| \frac{-b}{2a} = \frac{-12}{2} = -6 \Rightarrow \sqrt[3]{[-12, +\infty)} = [-2, +\infty)$$

$$19. \text{ (الف)} \quad y = \log(\frac{x^2-x+1}{x}) \Rightarrow D_A: \mathbb{R} \Rightarrow R = \mathbb{R} \Rightarrow \log(-\infty, +\infty) \Rightarrow \log(0, +\infty)$$

$$\Rightarrow R = (-\infty, +\infty)$$

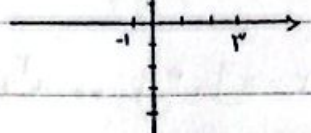
$$23. \text{ (ب)} \quad \log(\frac{x^2+1}{x}) \Rightarrow \frac{x^2+1}{x} = x + \frac{1}{x} \quad D: x > 0 \Rightarrow R = \log([2, +\infty)) = [1, +\infty)$$

$$a) y = \left| \frac{x-2}{1} \right| - \left| \frac{x-3}{1} \right|$$



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

مميز

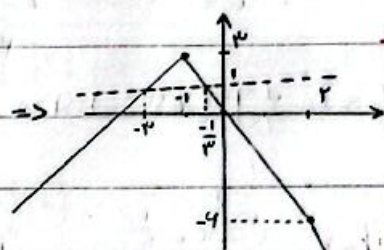


$$\Rightarrow R = [3, +\infty)$$

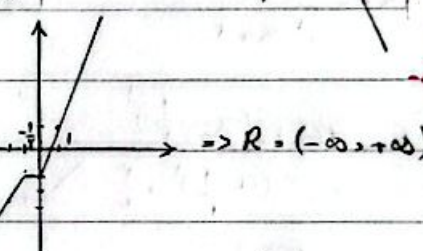
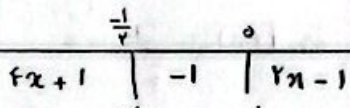
$$\left| \frac{x-2}{1} \right| - \left| \frac{x+2}{-1} \right| \leq 1$$

$$\begin{aligned} x+2 \leq 1 & \quad | \quad -x \leq 1 & \quad | \quad -x-2 \leq 1 \\ x \leq -3 & \quad (3) \quad x \geq -\frac{1}{2} & \quad (2) \quad x \geq -3 \end{aligned}$$

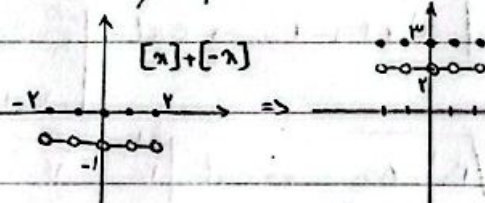
$$\Rightarrow R = (-\infty, -3] \cup \left[-\frac{1}{2}, +\infty\right)$$



$$y = 3x - \left| \frac{x+1}{\frac{1}{2}} \right| + \left| \frac{x}{1} \right|$$



$$a) y = [x] + [x-2] \Rightarrow y = [x] + [-x] + 2$$



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

$$b) y = 3x - [x]$$

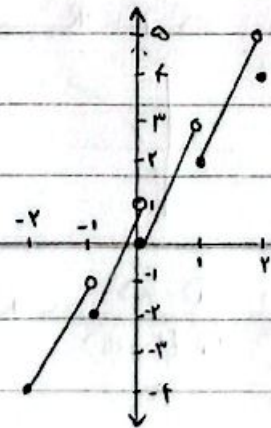
$$-2 \leq x < -1 \Rightarrow y = 3x + 2$$

$$-1 \leq x < 0 \Rightarrow y = 3x + 1$$

$$0 \leq x < 1 \Rightarrow y = 3x$$

$$1 \leq x < 2 \Rightarrow y = 3x - 1$$

$$x = 2 \Rightarrow y = 5$$



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

11

12 (iii) $\sin^2 x - \sin x + 1 \Rightarrow$ ① $\sin x = -1 \Rightarrow y = 1 + 1 + 1 = 3$

13 $-1 < \sin x < 1$ ② $\sin x = +1 \Rightarrow y = 1 - 1 + 1 = 1 \Rightarrow R = [\frac{3}{4}, 3]$

14 ③ $\sin x = \frac{-b}{2a} = \frac{1}{2} \Rightarrow y = \frac{1}{4} - \frac{1}{4} + 1 = \frac{3}{4}$

15

16 (ب) $\sin^2 x + \sin^2 x + 1 \Rightarrow$ ① $\sin^2 x = 0 \Rightarrow y = 0 + 0 + 1 = 1$

17 $0 < \sin^2 x < 1$ ② $\sin^2 x = 1 \Rightarrow y = 1 + 1 + 1 = 3 \Rightarrow R = [1, 3]$

18 ③ $\sin^2 x = \frac{-b}{2a} = \frac{-1}{2}$ غير ممكن

19

20