

۲۰ (افزایش)

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

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

$$3. \text{ (ب)} y = \frac{x^2+1}{|x|} = |x| + \frac{1}{|x|} \Rightarrow |x| \geq 0 \Rightarrow R = [2, +\infty)$$

$$4. y = \frac{x^2+2x-2}{x+3} \Rightarrow x^2+2x-2 = xy+3y \Rightarrow x^2+(2-y)x-(2+3y) = 0 \quad (2)$$

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

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

$$5. f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} \quad D: x^2-x+1 \neq 0 \Rightarrow \Delta < 0 \Rightarrow \text{همیشه مثبت} \Rightarrow D = \mathbb{R} \checkmark \quad (2)$$

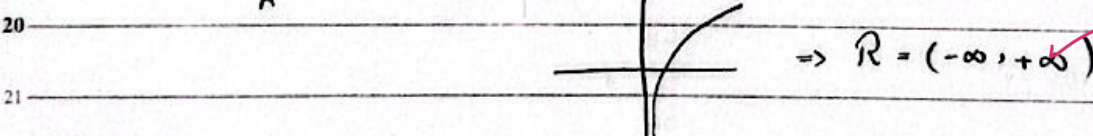
$$\min(x - \frac{1}{x})^2 = 0 \Rightarrow f(x) = \frac{0}{x} = 0$$

$$6. R: f(x) = (x - \frac{1}{x})^2 \Rightarrow \min(x - \frac{1}{x})^2 = 0 \Rightarrow f(x) = 0$$

$$7. \text{ (الف)} y = \sqrt{-x^2+4x-1} \Rightarrow \text{ext} = \left| \frac{-b}{2a} = \frac{-4}{-2} = 2 \Rightarrow R = \sqrt{(-\infty, 3]} = [0, \sqrt{3}] \checkmark \quad (2)$$

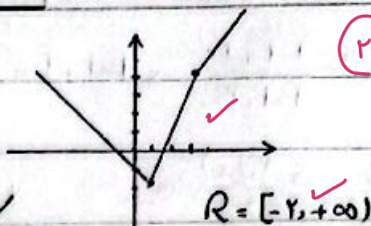
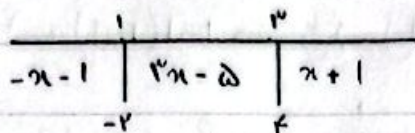
$$8. \text{ (ب)} y = \sqrt[3]{x^2-12x} \Rightarrow \text{ext} = \left| \frac{-b}{2a} = \frac{0}{2} = 0 \Rightarrow \min \sqrt[3]{(-\infty, +\infty)} = [-2, +\infty)$$

$$9. \text{ (الف)} y = \log(\frac{x^2-x+1}{x}) \Rightarrow D_A: \mathbb{R} \Rightarrow R = \mathbb{R} \Rightarrow \log(-\infty, +\infty) \Rightarrow \log(0, +\infty) \quad (2)$$



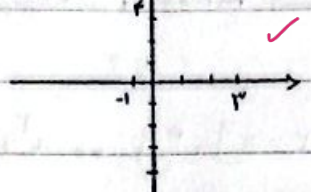
$$10. \text{ (ب)} \log(\frac{x^2+1}{x}) \Rightarrow \frac{x^2+1}{x} = x + \frac{1}{x} \quad D: x > 0 \Rightarrow R = \log(x, +\infty) = [1, +\infty)$$

$$a) y = |x-2| - |x-3|$$



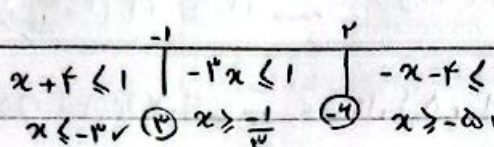
$$b) y = |x-3| + |x+1|$$

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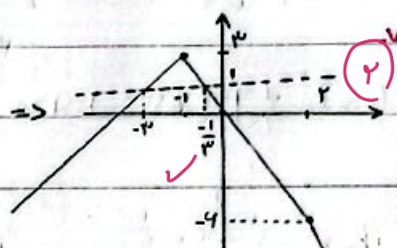


$$\Rightarrow R = [3, +\infty)$$

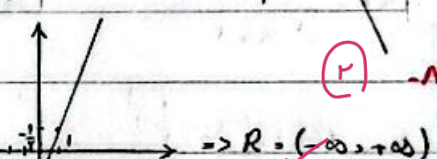
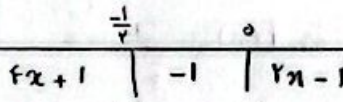
$$|x-2| - |x+2| \leq 1$$



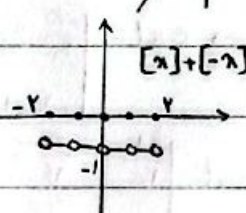
$$\Rightarrow R = (-\infty, -2] \cup [-\frac{1}{2}, +\infty)$$



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



$$a) y = [x] + [x-1] \Rightarrow y = [x] + [-x] + 1$$



$$\Rightarrow R = \{1, 2\}$$

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

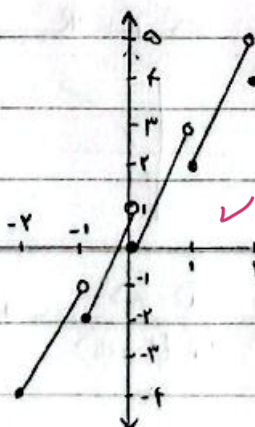
$$-2 \leq x < -1 \Rightarrow y = 3x + 2$$

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

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

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

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



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



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

(2)

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

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

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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 $\sin^2 x = \frac{-b}{2a} = \frac{-1}{2}$ عنقاً بل مقبول

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