

$${}^2g = \{(-1, 2), (0, 8), (2, 0), (1, 4)\}$$

(1)

$${}^3f = \{(-1, 0), (0, 3), (1, 0)\}$$

$$\text{مجموع بردار} = 2 + 0 + 4 = 11$$

$$f = \{(-1, 0), (0, 1), (1, 0)\}$$

$${}^2g - {}^3f = \{(-1, 2), (0, 3), (1, 4)\}$$

(2)

$$f(x) = 2x - 1 \quad D_f = [2, +\infty) \Rightarrow R_f = [\infty, +\infty) \quad (1)$$

$$g(x) = \frac{1}{x} x + 3 \quad D_g = (-\infty, 2] \Rightarrow R_g = (-\infty, 4] \quad (2)$$

$$(1) \cup (2) = (-\infty, 4] \cup [\infty, +\infty)$$

(3)

$$y = \frac{-x^2}{x} + x + 3$$

$$(a \> b) = \frac{-x^2}{x} + x + 3 > \frac{x}{x} \rightarrow \frac{-x^2}{x} - \frac{x}{x} + x + 3 > 0 \rightarrow \frac{-x^2 - x}{x} + x + 3 > 0$$

$$-x^2 - x + x + 3 > 0 \rightarrow -x^2 + 3 > 0 \rightarrow x^2 - 3 < 0 \rightarrow (x - \sqrt{3})(x + \sqrt{3})$$

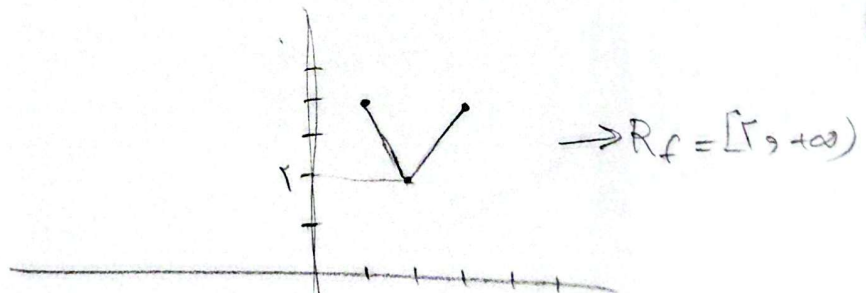
$$\Rightarrow \begin{array}{c} -1 \quad 3 \\ + \quad - \quad + \end{array} \Rightarrow \frac{a \quad b}{(-1 \quad 3)} \rightarrow \sqrt{3 - (-1)} = 2$$

$$x = 1 \rightarrow 4$$

$$x = 3 \rightarrow 4$$

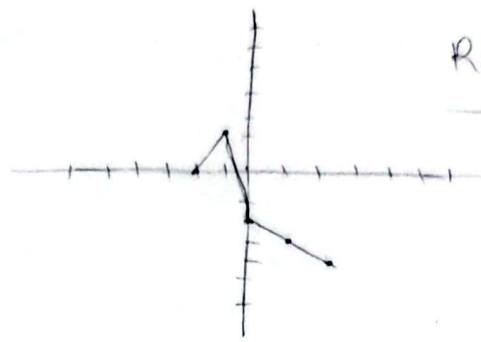
$$x = 2 \rightarrow 2$$

(4)



$$2 = \text{کثرترین مقدار} \leftarrow$$

$$\begin{aligned} x=0 &\rightarrow -2 \\ x=-1 &\rightarrow 1 \\ x=1 &\rightarrow -2 \\ x=2 &\rightarrow -5 \\ x=-2 &\rightarrow 0 \end{aligned}$$



$$R_f = (-\infty, -1]$$

(a)

$$y = \frac{x^2 + ax + m}{x+1} \Rightarrow yx + y = x^2 + ax + m \Rightarrow x^2 + (a-y)x + (m-y) = 0$$

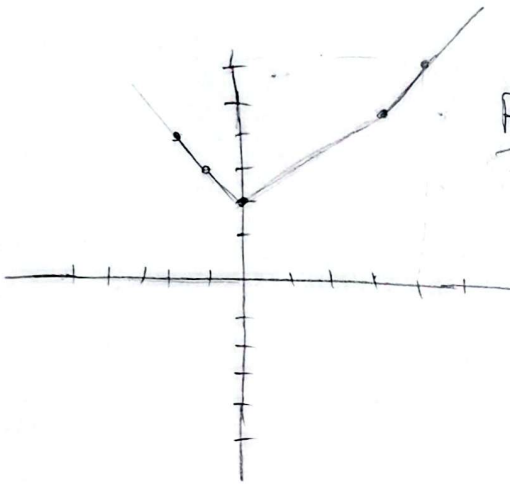
(5)

$$(a-y)^2 - 4(1)(m-y) \geq 0 \Rightarrow 2a + y^2 - 4y - 4m + 4y \geq 0$$

$$y^2 - 4y + 2a - 4m \geq 0 \Rightarrow y^2 - 4y + 2a - 4m \geq 0 \Rightarrow 4y - 4(1)(2a - 4m) \geq 0$$

$$\begin{aligned} \Rightarrow 4y - 400 + 16m &\geq 0 \\ -4y &\geq -16m \Rightarrow 4y \leq 16m \\ \Rightarrow y &\leq 4m \end{aligned}$$

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$$R_f = [2, +\infty)$$

(v)

$$R_f = \frac{-b}{2a} = \frac{-5}{2} = -2.5$$

$$(-1)^2 + 5(-1) + 2 = 1 - 5 + 2 = -2$$

$$\Rightarrow R_f = [-1, +\infty)$$

$$-1 \leq [x] - x \leq 0$$

$$f(x) = \begin{cases} x^2 + 5x + 2 & x \leq 0 \\ [x] - x & x > 0 \end{cases} \Rightarrow \emptyset$$

(1)

$$D_f = [b, +\infty) \quad \sqrt{4x+3} \geq 0 \Rightarrow 4x+3 \geq 0 \Rightarrow x \geq -\frac{3}{4} \quad \left(x \geq -\frac{3}{4}\right) \Rightarrow b = -\frac{3}{4}$$

(9)

$$\text{if } b = -\frac{3}{4} \rightarrow y = a + 1 - \sqrt{4x+3} \rightarrow a + 1 = a \Rightarrow a = 5$$

$$ab = 5 \times \left(-\frac{3}{4}\right) = -\frac{15}{4} = -3.75$$

$$f(x) = \sqrt{x+1} + \sqrt[3]{1-x}$$

$$g(x) = \sqrt[3]{\sqrt{x+1} + \sqrt[3]{1-x}} - f(x)$$

$$\frac{f(x)}{4} - \frac{g(x)}{3} = \frac{f(x)}{4} - \sqrt[3]{\sqrt{x+1} + \sqrt[3]{1-x}} + \frac{f(x)}{3}$$

$$\Rightarrow \frac{\sqrt[3]{f(x)}}{4} - \sqrt[3]{\sqrt{x+1} + \sqrt[3]{1-x}}$$

$$\Rightarrow \frac{\sqrt[3]{4\sqrt{x+1} + 1\sqrt[3]{1-x}}}{4} - \sqrt[3]{\sqrt{x+1} + \sqrt[3]{1-x}}$$

$$\Rightarrow \sqrt{x+1} + \sqrt[3]{1-x} - \sqrt[3]{\sqrt{x+1} + \sqrt[3]{1-x}}$$

$$\Rightarrow \begin{aligned} x+1 \geq 0 &\rightarrow x \geq -1 \rightarrow [-1, +\infty) \\ 1-x \geq 0 &\rightarrow 1 \geq x \rightarrow -x \geq -1 \rightarrow x \leq 1 \rightarrow (-\infty, 1] \end{aligned} \cap \rightarrow [-1, 1]$$

$$\Rightarrow R_f = [0, \sqrt[3]{2}]$$