

$$f(x) = \sqrt{x-4} + 2\sqrt{x-4} + 4 = |\sqrt{x-4} + 2| = \sqrt{x-4} + 2 \quad x \geq 4$$

$$g(x) = \sqrt{x-4} - 2\sqrt{x-4} + 4 = |\sqrt{x-4} - 2| = \sqrt{x-4} - 2$$

$$f(x) + g(x) = \sqrt{x-4} + 2 + \sqrt{x-4} - 2 = 2\sqrt{x-4}$$

$$\Rightarrow a=0 \quad c=-4 \quad b=2$$

$$\frac{a+b}{c} = \frac{0+2}{-4} = -\frac{1}{2}$$

$$f(2) = \frac{4}{4-1+3} = -2 \quad f(1) = \frac{3}{0} \times \infty \quad f(3) = \frac{5}{9-12+3} \times \infty$$

$$f(0) = \frac{4}{3}$$

$$\frac{g}{f} = \left\{ \left(2, -\frac{1}{2} \right), (0, 4) \right\}$$

درایه دوم: $x = m \quad x = \frac{m}{4} \rightarrow$ درایه اول: $x = m$

$$f(x) = \left\{ \left(\frac{1}{4}, 2 \right), \left(\frac{3}{4}, -1 \right), (2, 2), \left(-\frac{1}{4}, 4 \right) \right\}$$

ب) $x^2 = m \quad x = \pm \sqrt{m} \rightarrow$ درایه دوم: $x = \pm \sqrt{m}$

$$f(x^2) = \left\{ (1, 2), (-1, 2), (\sqrt{3}, -1), (-\sqrt{3}, -1), (2, 2), (-2, 2) \right\}$$

ج) $g(x) + 1 \rightarrow$ درایه دوم: $x^2 + 1 \Rightarrow g(x) + 1 = \{(-2, 1), (1, 3), (2, 4), (-1, 1)\}$

د) $\frac{2f}{g} \rightarrow$ اگر درایه اول برابر شود $\rightarrow$ درایه دوم: $(f) \div (g) \rightarrow \{(1, -4), (3, -1)\}$ $\infty \leftarrow \frac{1}{0}$

$$h(2) = 2 \times 1 + 3 = 5 \quad h(3) = 1 \times 2 + 3 = 5 \quad h(-2) = 0 \times 2 + 4 = 4$$

$$h = \{(2, 5), (-2, 4), (3, 5)\}$$

$$\frac{\sqrt{3x} - x}{x-2}$$

① $x \neq 2$ اگر x عضو Z باشد

② $x \in Z \rightarrow [x] + [-x] = -1 \rightarrow -1 + 1 = 0$ تن

اگر x عضو Z نباشد $\rightarrow [x] + [-x] = 0 \rightarrow 0 + 1 = 1$ ✓

③ $x \geq 0$

④ $\sqrt{3x} - x \geq 0 \rightarrow (m^2 - \sqrt{3}m) \geq 0 \quad m \geq 0$
 $\sqrt{3x} = m \quad m^2 - \sqrt{3}m \leq 0$

① ② ③ ④
 $\Rightarrow \{0, 1, 3\}$

$x_1 = 0 \quad x_2 = 3 \Rightarrow \frac{0}{+} - \frac{3}{+} = -\frac{3}{+}$

$$f(1) = \sqrt{5-1-4} = 0$$

$$h(1) = \frac{0}{4} = 0$$

$$f(2) = \sqrt{5-4-4} = \sqrt{2}$$

$$h(2) = \frac{\sqrt{2}}{4}$$

$$f(3) = \sqrt{5-14-4} = 0$$

$$h(3) = \frac{0}{4} = 0$$

$$f(4) = \sqrt{5-25-4} \rightarrow \infty \times$$

$$h = \{(1,0), (2, \frac{\sqrt{2}}{4}), (3,0)\}$$

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$$\text{الف) } y-1 = (x-1)^3 \rightarrow y = (x-1)^3 + 1 \rightarrow x-1 = \sqrt[3]{y-1} \rightarrow x = \sqrt[3]{y-1} + 1$$

$$R_f = \mathbb{R}$$

$$\text{ب) } yx^2 - 2xy = 1 \quad yx^2 - 2xy = 1 \pm 0$$

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$$x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \Rightarrow \begin{matrix} 4y^2 + 4y > 0 \\ y \neq 0 \end{matrix} \quad \frac{-1 \pm \sqrt{1+4}}{2} \Rightarrow R_f = (-\infty, -1] \cup (0, +\infty)$$

$$\text{الف) } yx^2 - 4x + 1 = 0 \quad \frac{-b}{2a} = \frac{4}{2} = 2 \quad y_{\min} = 4 - 1 + 1 = 4 \quad R_f = [4, +\infty)$$

$$\text{ب) } y = -x^2 + 9x + 3 \quad \frac{-b}{2a} = \frac{-9}{-2} = 4.5 \quad y_{\max} = -9 + 18 + 3 = 12 \quad R_f = (-\infty, 12]$$

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$$\text{ج) } \sqrt{x^2 - 4x - 3} \quad \frac{-b}{2a} = \frac{4}{2} = 2 \quad y_{\min} = \sqrt{4 - 16 - 3} = \sqrt{-15} \rightarrow R_f = [0, +\infty)$$

$$\text{د) } \sqrt{4x - x^2} \quad \frac{-b}{2a} = \frac{-4}{-2} = 2 \quad y_{\max} = \sqrt{16 - 9} = \sqrt{7} \quad R_f = [0, \sqrt{7}]$$

$$\text{الف) } \text{بزرگترین توان تابع} \Rightarrow R_f = \mathbb{R}$$

$$\text{ب) } \text{بزرگترین توان تابع} \Rightarrow R_f = \mathbb{R}$$

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$$\text{ج) } \sqrt{\mathbb{R}} \Rightarrow R_f = [0, +\infty)$$

$$\text{د) } (\mathbb{R})^2 \rightarrow \text{همه بزرگترین منفرد} \rightarrow R_f = [0, +\infty)$$

$$\text{الف) } R_f = \mathbb{R} \quad \left\{ \frac{a}{c} \right\} \subset \mathbb{R} \quad \{3\}$$

$$\text{ب) } R_f = \mathbb{R} \quad \{1\}$$

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