

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

$$g(x) = \sqrt{x-4}\sqrt{x-4} + 4-4 = (\sqrt{x-4}-2)^2 = |\sqrt{x-4}-2| \quad x-4 \geq 4 \Rightarrow x \geq 8$$

$$\sqrt{x-4} \geq 2 \rightarrow \sqrt{x-4} - 2$$

$$f(x), g(x) = 2\sqrt{x-4} = a + b\sqrt{x+c} \rightarrow a=0, b=2, c=-4 \rightarrow \frac{a+b}{-c} = \frac{2}{-4} = -\frac{1}{2}$$

$$Dg \cap Df = \{0, 1, 2, 3\} \cap \{1, 2, 3\} = \{1, 2\}$$

$$Df = \frac{x+2}{(x+1)(x-3)} \rightarrow R = \{1, 2\}$$

$$\frac{g}{f}(0) = \frac{4}{\frac{2}{3}} = 6 \quad \frac{g}{f}(2) = \frac{1}{\frac{2+2}{2-3}} = \frac{1}{-1} = -1 \rightarrow \frac{g}{f}(x) = \{0, 6\} \text{ و } \{1, -1\}$$

$$f(2) = \frac{4}{1 \cdot -1} = -4 \rightarrow \frac{g}{f}(2) = \frac{1}{-4} = -\frac{1}{4}$$

الف) $\{(-\frac{1}{4}, 6) \text{ و } (2, 2) \text{ و } (\frac{3}{4}, -1) \text{ و } (-\frac{1}{4}, 2)\}$
 ب) $\{(2, 2) \text{ و } (-2, 2) \text{ و } (\sqrt{3}, -1) \text{ و } (-\sqrt{3}, -1) \text{ و } (1, 2) \text{ و } (-1, 2)\}$

ج) $\{(-1, 1) \text{ و } (3, 6) \text{ و } (1, 3) \text{ و } (-2, 1)\}$
 د) $\{(1, 4) \text{ و } (3, 1)\}$

$$Dh = Df \cap Dg \rightarrow Dh = \{2, -2, 3\}$$

$$h(x) = 2f(x) + g(x) \rightarrow h = \{(2, 0) \text{ و } (-2, 4) \text{ و } (3, 5)\}$$

$$\begin{cases} n \in \mathbb{Z} \rightarrow g(n) + 1 = 0 \times \\ n \in \mathbb{Z} \rightarrow g(n) + 1 = 1 \checkmark \end{cases}$$

$$\begin{aligned} f(x) &\neq 0 \rightarrow g(x) = 0 \rightarrow g(x) + 1 = 0 + 1 \rightarrow 1 \neq 0 \checkmark \\ f(x) &\neq -1 \rightarrow g(x) = -1 \rightarrow g(x) + 1 = -1 + 1 = 0 \rightarrow \text{تن} \end{aligned} \quad \begin{cases} 3x \geq 0 \quad x \geq 0 \\ \sqrt{3x-x} \geq 0 \end{cases}$$

۱ ها باید عضو ج باشند در غیر این صورت مخرج $\frac{f}{g+1}$ صفر می شود!
 $Df = [0, 3] - \{2\} \leftarrow 0 \leq x \leq 3 \leftarrow 3x \geq x^2 \rightarrow x^2 - 3x \leq 0 \leftarrow \sqrt{3x-x} \geq 0$

$$\frac{Df}{g+1} = \{0, 1, 3\}$$

$$-x + 0x - \varepsilon \geq 0 \rightarrow x^2 - 0x + \varepsilon \leq 0 \rightarrow (x-1)(x-\varepsilon) \leq 0 \quad \frac{1}{+1-1+}$$

$$\{1, 2, \varepsilon\}$$

$$\hookrightarrow 12-20+12 \rightarrow 0$$

$$h(x) = \{(1, 0), (2, \sqrt{2}), (\varepsilon, 0)\} \quad \text{D}$$

$$\text{a) } y = x^3 - 3x^2 + 3x(-1+1) = y(x-1)^3 + 1$$

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

$$R_f = \mathbb{R} \quad \text{D}$$

$$\text{b) } y = \frac{1}{x^2 - 2x} \rightarrow x^2 y - 2xy = 1 \rightarrow x^2 y - 2xy - 1 = 0$$

$$\frac{y+0}{y \rightarrow 0} x = \varepsilon y(y+1) \geq 0 \rightarrow D_f = (-\infty, -1] \cup (0, +\infty)$$

$$\text{a) } y = x^2 - \varepsilon x + 10 \quad x = -\frac{-\varepsilon}{2} = +\frac{\varepsilon}{2} \rightarrow R_f = [\varepsilon, +\infty)$$

$$\text{b) } -x^2 + 4x + 12 \quad x = -\frac{4}{2(-1)} = -2 \quad (-\frac{b}{2a}) \rightarrow R_f = (-\infty, 12] \quad \text{D}$$

$$y_{\min} = -(2)^2 + 4(2) + 12 = 12 \rightarrow [-2, +\infty) \rightarrow \sqrt{[-2, +\infty)} \rightarrow R_f = [0, +\infty)$$

$$\text{c) } 4x - x^2 \quad x = \frac{-4}{2(-1)} = 2 \rightarrow x_{\min} = -(2)^2 + 4(2) = 4 \rightarrow \sqrt{[0, 4]} \rightarrow R_f = [0, 2]$$

$$\text{a) } \mathbb{R} \quad \text{D}$$

$$\text{b) } \mathbb{R} \quad \text{D}$$

$$\text{c) } [0, +\infty)$$

$$\text{d) } [0, +\infty)$$

$$\text{a) } y = \frac{x^2 + 1}{x-1} \rightarrow D_f = \mathbb{R} - \{1\} \quad \text{D}$$

$$\text{b) } y = \frac{x^2 + 1}{x+1} \rightarrow D_f = \mathbb{R} - \{-1\}$$

$$Df = \mathbb{R} - \{1, 3\} \quad (x^2 - 4x + 3 \neq 0 \rightarrow x \neq 1, 3)$$

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$$Df \cap Dg = \{1, 0\} \rightarrow \frac{g}{f} = \left\{ \left(1, -\frac{1}{4}\right), (0, 4) \right\}$$

$$f(x) = \frac{\sqrt{3x} - x}{x - 2} \rightarrow \begin{cases} x \neq 2 \\ x \geq 0 \end{cases} \quad \begin{cases} \sqrt{3x} \\ \sqrt{3x} - x \geq 0 \rightarrow 3x \geq x^2 \rightarrow 0 \leq x \leq 3 \end{cases} \rightarrow Df = [0, 3] - \{2\} \quad (\infty)$$

$$g(x) + 1 \neq 0 \rightarrow g(x) \neq -1 \rightarrow [x] + [-x] \neq -1 \rightarrow x \in \mathbb{Z}$$

$$D_{\frac{f}{g+1}} = \left\{ Df \cap Dg, g(x) \neq -1 \right\} = \left\{ 0, 1, 3 \right\}$$

$\downarrow$
 $[0, 3] - \{2\} \cap \mathbb{Z}$