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$$f(x) = \left(\frac{1}{x}\right)^{x-2} - 1 \Rightarrow f(x+1) = \left(\frac{1}{x+1}\right)^{x-1} - 1 = 0 \Rightarrow x \leq 1$$

و هر توانی که بر سر + قرار دارد

$$y = \sqrt{x^3 f(x+1)} = ?$$

↓

$$x > 0 \Rightarrow \text{چون توان 2 دارد} \Rightarrow D_f = x > 0 \Rightarrow D_f = x \geq 0 \Rightarrow D_f = 0 \leq x \leq 1$$

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$$f(x) = \sqrt{x + |x+2|}$$

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

$$\left\{ \begin{array}{l} f(-x) = \sqrt{2x+2} > 0 \Rightarrow 2x+2 > 0 \Rightarrow x > -1 \\ f(-x) = \sqrt{-x-2} \end{array} \right.$$

و  $x \leq 1$

$$D_f = -1 \leq x$$

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

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$$y = \sqrt{\frac{x-1}{f(x)}} \quad f(x) \neq -1, 2, 3 \Rightarrow \text{باقی مانده}$$

$$x-1 > 0 \Rightarrow x > 1$$

$$-\frac{1}{x} - \frac{1}{x} + \frac{2}{x} + \frac{3}{x} = \frac{-1-1+2+3}{x} = \frac{3}{x}$$

$$D_f = [1, 2) \cup (2, 3)$$

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$$y_1 = \frac{1}{9x^2 - \sqrt{2x^2 - 2x - 3}}$$

$$x < 1 \Rightarrow 9 - \sqrt{2 - 2 - 3} = 6 \neq 0 \vee$$

$$x = 2 \Rightarrow 18 - \sqrt{8 - 4 - 3} = 15 \neq 0 \vee$$

$$y_2 = \frac{1}{\sqrt{2x^2 + ax + b}} > 0 \Rightarrow x < 1 \Rightarrow a + b < -2$$

$$x = 2 \Rightarrow \sqrt{2a + b - 1} = 0 \Rightarrow 2a + b = 1$$

$$a < 9 \quad b < 12$$

$$D_{y_1} = D_{y_2} \quad \sqrt{-(a+b)} \Rightarrow \sqrt{-(-5)} = \sqrt{5}$$

$$f(x) = ax^2 + bx + c = 2x^2 - 4x + 14 \Rightarrow a = -1, b = -2$$

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$$f(x) = x^2 + 9 \quad f\left(\frac{x}{2}\right) = \left(\frac{x}{2}\right)^2 + \frac{9}{2}$$

$$y = \sqrt{f(x) - f\left(\frac{x}{2}\right)} \Rightarrow \sqrt{x^2 + x - \frac{4x}{2} - \frac{9}{2}} = \sqrt{\frac{x^2 - 4x}{2} + \frac{x^2 - 9}{2}}$$

$$\frac{x^2 - 4x}{2} \geq 0 \Rightarrow x \geq 4$$

$$x^2 - 9 \geq 0 \Rightarrow x \geq 3 \quad x \leq -2 \Rightarrow \text{مخرج منفی می شود}$$

$$D_f = [3, +\infty)$$

$$\frac{(x^2 - 4)(x^2 + 9x + 14)}{x^2} \Rightarrow D_f = [-2, 0) \cup [3, +\infty)$$

$$f(x^2 + x) = 2x^2 - 1 \quad x^2 + x \geq 1, \Rightarrow x \geq 1$$

$$f(x) = f(1) = 0 \quad x^2 + x = 1 \Rightarrow x = 1$$

$$f(1) \xrightarrow{x=1} 1 - 1 = 0$$

$$f(x) \xrightarrow{x \geq 1} 0$$

$$f(x) + f(1) = 1$$

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$$x^2 + 4x^2 + 4x + 4x - 4x = 0 \quad (x+2)^2 - 4x \xrightarrow{\text{مشتق}} -4$$

$$x^2 - 4x^2 + 4x + 1 - 1 = 0 \quad (x-2)^2 + 1 \xrightarrow{\text{مشتق}} -10\sqrt{x} + 4\sqrt{x} - 10$$

$$\frac{g(x)}{f(x)} = \frac{g(\sqrt{x}-2)}{g(\sqrt{x}-2)} = \frac{-4}{-10\sqrt{x} + 4\sqrt{x} - 10} = -4$$

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$$f(x) = \sqrt{x+5} \sqrt{x-5} \quad g(x) = \sqrt{x-5} \sqrt{x-5}$$

$$\Rightarrow \sqrt{x+5} \sqrt{x-5} + \sqrt{x-5} \sqrt{x-5} \Rightarrow \sqrt{(x-5)(\sqrt{x-5} + 5)} + \sqrt{(x-5) + 5\sqrt{x-5}} + 5$$

$$\Rightarrow \sqrt{(\sqrt{x-5} + 5)^2} + (\sqrt{x-5} + 5)^2 \Rightarrow \sqrt{x-5} + 5 + 1 \Rightarrow \sqrt{x-5} + 6 \quad x \geq 5$$

$$2\sqrt{x-5} - 5 + 5 = \sqrt{x+5} \times a + b \Rightarrow a+b = 2 \quad \frac{a+b}{c} = -\frac{1}{5}$$

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$$f(x) = \frac{x+2}{x^2-5x+3} \Rightarrow x = -2 \quad x \geq 1, 3$$

$$g(x) = \{(2, 1), (1, 0), (3, 5), (0, 5)\} \Rightarrow Dg = \{0, 1, 2, 3\}$$

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

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$$\text{مشتق بنابر قسمة} \quad Dg \cap Df = \frac{g}{f} \Rightarrow Dg \cap Df = \{x \mid f(x) \neq 0\} = \{0, 1, 2, 3\} - \{2, 1, 3\}$$

$$\Rightarrow Dg = \{0, 2\}$$

$$f(x) = \{(1, 2), (2, -1), (3, 2), (-1, 9)\} \quad g(x) = \{(-2, 3), (1, -1), (2, 2), (-1, 9)\}$$

$$\text{الف) } f(x) = \left\{ \left( \frac{1}{2}, 2 \right), \left( \frac{3}{2}, -1 \right), \left( \frac{5}{2}, 2 \right), \left( -\frac{1}{2}, 9 \right) \right\}$$

$$\text{ب) } f(x) = \{(-1, 2), (1, 2), (\sqrt{3}, -1), (-\sqrt{3}, -1), (-2, 2), (2, 2)\}$$

$$\text{ج) } 2g^2(x) + 1 = \{(-2, 19), (1, 5), (2, 9), (-1, 1)\}$$

$$\text{د) } \frac{f}{g} \Rightarrow Df - Dg = \{x \mid g(x) \neq 0\} = \{1, 2\}$$

$$(1, 2) \times (2, -1)$$

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