

$$21^3 f(a+1) \geq 0 \rightarrow \begin{cases} 21^3 \geq 0, f(a+1) \geq 0 & (21) \\ 21^3 \leq 0, f(a+1) \leq 0 & (22) \end{cases}$$

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$$(21) \Rightarrow f(a+1) \geq 0 \Rightarrow \left(\frac{1}{2}\right)^{a-1} - 1 \geq 0 \Rightarrow \left(\frac{1}{2}\right)^{a-1} \geq 1 \Rightarrow a-1 \leq 0 \Rightarrow a \leq 1$$

$$21^3 \geq 0 \Rightarrow a \geq 0 \Rightarrow (1) \Rightarrow 0 \leq a \leq 1$$

$$(22) \Rightarrow f(a+1) \leq 0 \Rightarrow \left(\frac{1}{2}\right)^{a-1} - 1 \leq 0 \Rightarrow \left(\frac{1}{2}\right)^{a-1} \leq 1 \Rightarrow a-1 \geq 0 \Rightarrow a \geq 1, 21^3 \leq 0 \Rightarrow a \leq 0$$

$$\Rightarrow (22) \Rightarrow \emptyset \Rightarrow Df = [0, 1] \checkmark$$

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$$f(-a) = \sqrt{-a+1} - a+2 \Rightarrow -a+1 \geq 0 \Rightarrow -a+2 \geq a \Rightarrow | -a+2 | \geq a$$

$$\begin{cases} -a+2 \geq a \Rightarrow 2 \geq 2a \Rightarrow 1 \geq a \\ -a+2 \leq -a \Rightarrow \text{غیر ممکن} \end{cases}$$

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$$\Rightarrow Df = (-\infty, 1] \checkmark$$

$$f(a) \neq 0 \Rightarrow a \neq \{-\infty, -4, 2, 3\}, Dg \in D_{a1}$$

$$\frac{a-1}{f(a)} \geq 0 \rightarrow \begin{cases} a-1 \geq 0, f(a) \geq 0 & (I) \\ a-1 \leq 0, f(a) \leq 0 & (II) \end{cases}$$

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$$(I) \Rightarrow a \geq 1, f(a) \geq 0 \Rightarrow a = [-\infty, -4) \cup (2, 3) \Rightarrow (I) \Rightarrow (2, 3)$$

$$(II) \Rightarrow a \leq 1, f(a) \leq 0 \Rightarrow a = (-\infty, 2) \Rightarrow (II) = (-\infty, 1]$$

$$I \cap II \Rightarrow D_{g1} = (-4, 1] \cup (2, 3) \checkmark$$

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$$9a^2 - 4a^2 - 4a - 3 = a(9a^2 - 4) - 4 - 3 = a(9a^2 - 4) - 7 = a(3a^2 - 2\sqrt{3})(3a^2 + 2\sqrt{3}) - 7 - 3$$

$$= (3a^2 - 2\sqrt{3})(3a^2 + 2\sqrt{3}) - 10 \Rightarrow (3a^2 - 2\sqrt{3})(3a^2 + 2\sqrt{3}) \neq 0$$

$$\Rightarrow (3a^2 - 2\sqrt{3}) \neq 0 \quad \Delta < 0, \text{پایه}$$

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$$D_{g1} = D(f) \Rightarrow 3a^2 - 4a - 3 = 3a^2 + a + b \Rightarrow a = -1, b = -3$$

$$\Rightarrow \sqrt{-(a+b)} = \sqrt{-(-4)} = \sqrt{4} = 2 \checkmark$$

$$f(a) = f\left(\frac{1}{a}\right), 21^3 + a - \frac{4}{a} = \frac{4}{a} \Rightarrow \frac{21^3 + a^2 - 4}{a} = \frac{4}{a} \Rightarrow \frac{21^3 + a^2 - 4 - 4}{a} = 0 \Rightarrow \frac{21^3 + a^2 - 8}{a} = 0$$

$$\Rightarrow \frac{21^3 + a^2 - 8}{a} = 0 \Rightarrow \frac{(21^3 - 8)(21^3 + 42 + 16)}{a} = \frac{(21^3 - 8)(21^3 + 42 + 16)}{a}$$

$$\Rightarrow \frac{(21^3 - 8)(21^3 + 42 + 16)}{a} \geq 0 \Rightarrow \frac{21^3 - 8}{a} \geq 0 \Rightarrow \frac{21^3 - 8}{21^3} \geq 0 \Rightarrow \frac{21^3 - 8}{21^3} \geq 0$$

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$$\Rightarrow Df = [-2, 0) \cup [2, +\infty) \checkmark$$

$$u=1 \rightarrow f(1+1) = 2-1 \Rightarrow f(2)=1$$

$$u=2 \rightarrow f(2+2) = 2-1 \Rightarrow f(4)=2$$

$$\left. \begin{array}{l} f(2) + f(4) = 1+2 = 3 \\ f(4) + f(8) = 2+4 = 6 \end{array} \right\} f(2^n) = 2^{n-1}$$

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$$f(u) = u^3 - 9u^2 + 17u - 1 + 1 = (u-2)^3 + 1 \Rightarrow f(\sqrt[3]{v} + 2) = (\sqrt[3]{v} + 2)^3 + 1 = 10$$

$$g(u) = u^3 + 9u^2 + 17u + 1 - 2v = (u+3)^3 - 2v \Rightarrow g(\sqrt[3]{v} - 3) = (\sqrt[3]{v} - 3)^3 - 2v = -10$$

$$\Rightarrow \frac{g(\sqrt[3]{v} - 3)}{f(\sqrt[3]{v} + 2)} = \frac{-10}{10} = -1$$

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

$$g(u) = \sqrt{u-2} - 2 = \sqrt{(u-2)-2} = \sqrt{u-4} = \sqrt{u-2-2} = \sqrt{u-2} - 2$$

$$f(u) + g(u) = \sqrt{u-2} + 2 + \sqrt{u-2} - 2 = 2\sqrt{u-2} = a + b\sqrt{u+c}$$

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

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$$f(u) = \frac{u+2}{(u-3)(u-1)} \Rightarrow Df, R - \{3, 1\}$$

$$D\left(\frac{g}{f}\right) = Dg \cap Df = \{u \mid f(u) \neq 0\} \Rightarrow D\left(\frac{g}{f}\right) = \{2, 0\}$$

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

$$f(x, y) = \{(0, 2), (1, -1), (2, 2), (-1, 2)\}$$

$$f(x^2, y) = \{(\pm 1, 2), (\pm \sqrt{2}, -1), (\pm 2, 2)\}$$

$$y^2 g(x) + 1 = \{(-2, 1), (1, 3), (3, 9), (-1, 1)\}$$

$$\frac{y^2}{g} = \left\{ \left(1, \frac{1}{-1}\right), \left(3, \frac{1}{9}\right) \right\}$$

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