

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

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

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

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

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

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

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

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

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

$$\frac{a-1}{f(a)} \geq 0 \rightarrow \begin{cases} a-1 \geq 0, f(a) \geq 0 & (2) \\ a-1 \leq 0, f(a) \leq 0 & (22) \end{cases}$$

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

$$(22) \Rightarrow a \leq 1, f(a) \leq 0 \Rightarrow a = (-\infty, 2) \Rightarrow (22) = (-\infty, 1]$$

$$I \cap II \Rightarrow Dg = (-4, 1] \cup (2, 3)$$

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

$$= (3a^2 - 4a - 3)(3a^2 + a + 1) \Rightarrow (3a^2 - 4a - 3)(3a^2 + a + 1) \neq 0$$

$$\Rightarrow (3a^2 - 4a - 3) \neq 0 \quad \Delta < 0, \text{پایه}$$

$$Dg = D(f) \Rightarrow 3a^2 - 4a - 3 = 3a^2 + a + b \Rightarrow a = -1, b = -3$$

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

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

$$\Rightarrow \frac{a^4 - 4a^2 + 21^3 - 4}{a^3} = \frac{(a^2 - 2)(a^2 + 21^3 + 4)}{a^3} = \frac{(a^2 - 2)(a^2 + 21^3 + 4)}{a^3}$$

$$\Rightarrow \frac{(a^2 - 2)(a^2 + 21^3 + 4)}{a^3} \geq 0 \Rightarrow \frac{a^2 - 2}{a^3} \geq 0 \xrightarrow{a^2} \frac{a^2 - 2}{a^3} \geq 0 \Rightarrow \frac{a^2 - 2}{a^3} \geq 0$$

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

$u=1 \rightarrow f(1+1)=2-1 \Rightarrow f(2)=1$ $u=2 \rightarrow f(2+2)=2-1 \Rightarrow f(4)=2$ $\left. \begin{array}{l} f(2)=1 \\ f(4)=2 \end{array} \right\} f(2^k)=2^{k-1}, 1+2=3$	6
$f(u) = u^2 - 9u + 14 \Rightarrow f(u-2) = (u-2)^2 + 8 \Rightarrow f(\sqrt{u}+2) = (\sqrt{u})^2 + 8 = 10$ $g(u) = u^2 + 4u + 2 \Rightarrow g(u+3) = (u+3)^2 - 2 \Rightarrow g(\sqrt{u}-3) = (\sqrt{u})^2 - 2 = -10$ $\Rightarrow \frac{g(\sqrt{u}-3)}{f(\sqrt{u}+2)} = \frac{-10}{10} = -1$	7
$f(u) = \sqrt{u-4} = \sqrt{(u-4)^2} = u-4 = \sqrt{u-4} + 2$ $g(u) = \sqrt{u-4} = \sqrt{(u-4)^2} = u-4 = \sqrt{u-4} - 2$ $f(u) + g(u) = \sqrt{u-4} + 2 + \sqrt{u-4} - 2 = 2\sqrt{u-4} = a + b\sqrt{u+c}$ $\Rightarrow a=0, b=2, c=-4 \Rightarrow \frac{a+b}{c} = \frac{2}{-4} = -\frac{1}{2}$	8
$f(u) = \frac{u+2}{(u-3)(u-1)} \Rightarrow D_f = \mathbb{R} - \{3, 1\}$ $D\left(\frac{g}{f}\right) = D_g \cap D_f = \{u \mid f(u) \neq 0\} \Rightarrow D\left(\frac{g}{f}\right) = \{2, 0\}$ $\Rightarrow \frac{g}{f} = \left\{ \left(2, \frac{1}{-4}\right), \left(0, \frac{15}{-2}\right) \right\}$	9
$f(x) = \{(0,2), (1,2), (2,2), (-1,2)\}$ $f(x^2) = \{(1,2), (4,2), (9,2)\}$ $g^2(x) + 1 = \{(-2,9), (1,9), (3,9), (-1,1)\}$ $\frac{f}{g} = \left\{ \left(1, \frac{15}{-1}\right), \left(3, \frac{-2}{1}\right) \right\}$	10