

$$t = \sqrt{a-4} \quad a = t^2 + 4 \quad f(a) = \sqrt{t^2 + 4 + 4t} = \sqrt{(t+2)^2} = t+2$$

$$a \geq 1 \rightarrow t^2 + 4 \geq 1 \rightarrow t^2 \geq -3 \rightarrow t \geq -2 \rightarrow g(a) = \sqrt{t^2 + 4 - 4t}$$

$$\sqrt{(t-2)^2} = t-2 \rightarrow f(a) + g(a) = (t+2) + (t-2) = 2t = 2\sqrt{a-4}$$

$$a=0, b=2, c=-4 \quad \frac{a+b}{c} = \frac{2}{-4} = \left(-\frac{1}{2}\right)$$

$$f(a) = \frac{a+2}{(a-1)(a-2)} \rightarrow \text{در تقاطع منحنی ها} \rightarrow g(x) \rightarrow a=2, a=0$$

$$g(2) = 1 \quad f(2) = \frac{2+2}{2-1+2} = \frac{4}{3} = \left(\frac{4}{3}\right) \quad \frac{g(2)}{f(2)} = \left(\frac{3}{4}\right)$$

$$g(0) = 4 \quad f(0) = \frac{2}{0} \rightarrow 2 \times \frac{2}{0} = 6 \quad \frac{g}{f} = \left\{ \left(2, \frac{3}{4}\right), (0, 6) \right\}$$

$$g(-2) = 2 \rightarrow 2(2^2) + 1 = 11 + 1 = 12$$

$$(-2, 12)$$

$$f(g(a) + 1) = \left\{ (-2, 12), (1, 3), (3, 9), (-1, 1) \right\}$$

$$g \neq 0 \rightarrow g(-1) = 0 \times (-1) = 0$$

$$Dg \cap Df = \{2, 3, 4\} \rightarrow \frac{f}{g} = \left\{ (2, \frac{3}{4}), (3, 1), (4, 2) \right\}$$

$$Df \cap Dg = \{2, 3, 4\}$$

$$a=2 \rightarrow h(2) = 2f(2) + g(2) = 2 \times \frac{4}{3} + 1 = \frac{10}{3}$$

$$a=3 \rightarrow h(3) = 2(1) + 3 = 5$$

$$a=4 \rightarrow h(4) = 2 \times 0 + 6 = 6$$

$$h = \left\{ (2, \frac{10}{3}), (3, 5), (4, 6) \right\}$$

$$Dg \rightarrow g(a) + 1 \neq 0 \rightarrow g(a) \neq -1 \quad \frac{f(a)}{g(a)} = \frac{[a] + [-a]}{[a] + [-a]} \rightarrow 0 \quad \checkmark$$

$$\frac{f(a)}{g(a)} = \frac{[a] + [-a]}{[a] + [-a]} \rightarrow -1 \quad \times \rightarrow a \in \mathbb{Z}$$

$$Df \rightarrow \sqrt{4a} - a \geq 0 \rightarrow 2\sqrt{a} \geq a \rightarrow \frac{0}{0} \rightarrow \frac{2}{2} \rightarrow 1 \rightarrow 0 \leq a \leq 4$$

$$a \neq 1$$

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

|                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                     |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| $\sqrt{-(a^2 - 5a + 4)} \rightarrow \sqrt{-(a-1)(a-4)} = \frac{1}{a-1} \rightarrow 1 < a < 4$ $D_f \cap D_g = \{1, 2, 4\} \rightarrow a=1 \rightarrow f = \sqrt{10-1-4} = 0$ $a=2 \rightarrow f(2) = \sqrt{10-4-4} = 0$ $a=4 \rightarrow f(4) = \sqrt{10-16-4} = 0$ $h = \left\{ (1,0), (2, \frac{\sqrt{2}}{2}), (4,0) \right\}$ | $h = \left\{ (1,0), (2, \frac{\sqrt{2}}{2}), (4,0) \right\}$                                                                                                                                                                                                                        | 6  |
| $y = \frac{1}{x^2 - 2x} \rightarrow \frac{1}{y} = x^2 - 2x + 1 - 1$ $(x^2 - 1)^2 - 1 = \frac{1}{y} \rightarrow \frac{1}{y} + 1 = (x-1)^2$ $x = 1 \pm \sqrt{1 + \frac{1}{y}}$                                                                                                                                                     | $a = t+1$ $g = (t+1)^3 - 3(t+1)^2 + 2(t+1)$ $g = t^3 - t$ $g \in \mathbb{R}$                                                                                                                                                                                                        | 7  |
| $a) 0 \rightarrow \min$ $\{a = \frac{-b}{2a} = \frac{4}{4} = 1$ $y = 4x^2 - 8x + 4 \rightarrow \sqrt{-7, +\infty} \rightarrow [0, +\infty)$ $a < 0 \rightarrow \max$ $\{a = \frac{-b}{2a} = \frac{-4}{-4} = 1$ $y = 4x^2 - 8x + 4 \rightarrow \sqrt{1, -\infty} \rightarrow [0, 1]$                                              | $a) 0 \rightarrow \min$ $\{a = \frac{-b}{2a} = \frac{4}{4} = 1$ $y = 4x^2 - 8x + 4 \rightarrow \sqrt{-7, +\infty} \rightarrow [0, +\infty)$ $a < 0 \rightarrow \max$ $\{a = \frac{-b}{2a} = \frac{-4}{-4} = 1$ $y = 4x^2 - 8x + 4 \rightarrow \sqrt{1, -\infty} \rightarrow [0, 1]$ | 8  |
| $\sqrt{12} \rightarrow [0, +\infty) \rightarrow \mathbb{R}^+$                                                                                                                                                                                                                                                                    | $\mathbb{R} \rightarrow \mathbb{R}^+$                                                                                                                                                                                                                                               | 9  |
| $\mathbb{R} - \left\{ \frac{3}{4} \right\}$                                                                                                                                                                                                                                                                                      | $\mathbb{R} - \{2\}$                                                                                                                                                                                                                                                                | 10 |