

$$f(x) = \sqrt{\log_p(x-1)} \rightarrow \log_p(x-1) \geq 0 \Rightarrow x-1 \geq 1 \Rightarrow Df = [2, +\infty)$$

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

$$(f(x)-2)^2 \leq 0 \rightarrow \text{تنها پاسخ } f(x)=2 \Rightarrow \sqrt{\log_p(x-1)}=2 \Rightarrow \log_p(x-1)=4$$

$$\Rightarrow x-1=14 \Rightarrow x=15 \rightarrow Dg(f(x)) = \{15\} \checkmark \textcircled{2}$$

$$f(g(x)) = f(x^2-3x+11) = 2(x^2-3x+11) - 5 = 2x^2 - 6x + 21 \quad \{ g(f(x)) = g(2x-5) \}$$

$$\Rightarrow g(f(x)) = (2x-5)^2 - 2(2x-5) + 11 \Rightarrow g(f(x)) = 4x^2 - 4x + 11$$

$$f(g(x)) = g(f(x)) \Rightarrow 2x^2 - 6x + 21 = 4x^2 - 4x + 11 \Rightarrow 2x^2 - 20x + 10 = 0$$

$$x_1 + x_2 = 5 = -\frac{b}{a} = 10, \quad x_1 \cdot x_2 = p = \frac{c}{a} = \frac{10}{2} = 5 \quad \textcircled{2}$$

$$\hookrightarrow x_1^2 + x_2^2 = 5^2 - 2p = 10 - 2(5) = 0 \checkmark$$

$$g(f(x)) = 5x^2 + 11, \quad f(x) = 2x \Rightarrow 2x = t \Rightarrow x = \frac{t}{2}$$

$$g(x) = 5\left(\frac{t}{2}\right)^2 + 11 \Rightarrow g(x) = \frac{5}{4}x^2 + 11 \Rightarrow g(x-v) = \frac{5}{4}(x-v)^2 + 11$$

$$y_{\min} \xrightarrow{\text{میزان } x} \frac{5}{4}(v-v)^2 + 11 \Rightarrow y_{\min} = 11 \checkmark \textcircled{2}$$

$$f(x) = 3x - 4 \rightarrow f(g(x)) = 3(g(x)) - 4, \quad f(g(x)) = 3x^2 - 9x - 1$$

$$\Rightarrow 3g(x) - 4 = 3x^2 - 9x - 1 \Rightarrow 3g(x) = 3x^2 - 9x + 3 \Rightarrow g(x) = x^2 - 3x + 1$$

$$\Rightarrow g(x) = (x-1)^2 \rightarrow f(g(x)) = (3x-4-1)^2 = (3x-5)^2 = 9x^2 - 30x + 25 \checkmark \textcircled{2}$$

$$f-g = -x+5, \quad 3f(x) = 2g(x)+14 \Rightarrow f(x) = \frac{2}{3}g(x) + \frac{14}{3}$$

$$\hookrightarrow \frac{2}{3}g(x) + \frac{14}{3} - g(x) = -x+5 \Rightarrow \underbrace{g(x) = 3x-1}_{x \neq 1} \quad \{ 3f(x) = 2(3x-1) + 14 \}$$

$$\Rightarrow \underline{f(x) = 2x+2} \quad f(g(x)) = f(3x-1) = 2(3x-1) + 2 = 4x+2$$

$$\Rightarrow 0 = 4x+2 \Rightarrow x = -\frac{1}{2} \Rightarrow a = -\frac{1}{2} \checkmark \textcircled{2}$$

$$g(f(x)) = \log_2 9^x = x \log_2 9 = 2x, \quad f(g(x)) = 9^{\log_2 x} = x^{\log_2 9} = x^2$$

$$f(g(x)) \leq g(f(x)) \Rightarrow x^2 \leq 2x \Rightarrow x^2 - 2x \leq 0 \quad + | - | +$$

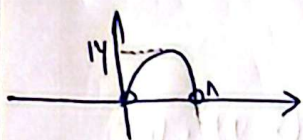
$$(0, 2] \text{ حاصل خای } \leftarrow x > 0 \leftarrow g(x) = \log_2 x \text{ ولی } 0 \leq x \leq 2 \leftarrow$$

اعدد صحیح ۱، ۲ حاصل خای اند. ✓ (۲)

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

$$\Rightarrow f\left(x - \frac{1}{x}\right) = \underbrace{x^2 - 2 + \frac{1}{x^2}}_{t^2} + \underbrace{x - \frac{1}{x}}_t \Rightarrow f(x) = x^2 + x \quad \checkmark (۲)$$

$$f(g(x)) = \log_2 14 - x^2 \Rightarrow 14 - x^2 > 0 \Rightarrow D f(g(x)) = (0, \sqrt{14}) \rightarrow A$$



$$\log_2 14 = 4, \quad \text{وقتی } \log_2 x / 7 \text{ و } x \text{ صحت معبر برورد حاصل می شود}$$

کست منفی بی نهایت می رود.

$$\Rightarrow R f(g(x)) = (0, 4] \rightarrow B$$

$$A \cap B = (0, 4] \rightarrow \checkmark \text{ حاصل اعداد صحیح ۱، ۲، ۳، ۴} \quad (۲)$$

$$f(f(x)) = 1 - 3f^2(x) \Rightarrow f(x) = 1 - 3x^2, \quad h(g(x)) = (x-1)^3 + 2(x-1) + 1$$

$$\Rightarrow h(g(x)) = x^3 - 3x^2 + 3x - 1 + 2x - 2 + 1 = x^3 - 3x^2$$

$$\Rightarrow x^3 + 5x - 3 = 0 \xrightarrow{\text{سختی}} (3x^2 + 5) \rightarrow \text{تنها یک جواب دارد} \quad \checkmark (۲)$$

$$f(x) = x - \frac{\epsilon}{x} \Rightarrow 3 = x - \frac{\epsilon}{x} \xrightarrow{x(x)} x^2 - 3x - \epsilon \Rightarrow (x-\epsilon)(x+1) = 0$$

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

$$g\left(\frac{f(-1)}{3}\right) = -a - 2 = 1 \quad (g(3) = 1) \Rightarrow \begin{cases} a = 0 \\ a = -1 \end{cases} \quad \checkmark (۲)$$