

$$Dg \circ f = \{x \mid x \in Df, f(x) \in Dg\} \Rightarrow Df \Rightarrow \begin{cases} \textcircled{1} x-1 > 0 \Rightarrow x > 1 \\ \textcircled{2} \log_2 x > 0 \Rightarrow x > 1 \end{cases}$$

$$Df = \{x > 1\}$$

$$\Rightarrow Dg \Rightarrow -\underbrace{(x-2)^2}_{\geq 0} \geq 0 \Rightarrow Dg = \{2\} \Rightarrow Dg \circ f \Rightarrow \sqrt{\log_2 x} = 2$$

$$\log_2 x = 4 \Rightarrow x-1 = 14 \Rightarrow x = 15 \quad \checkmark$$

$$f \circ g = g \circ f \Rightarrow 2(x^2 - 2x + 1) - 5 = (2x - 5)^2 - 2(2x - 5) + 1$$

$$2x^2 - 4x + 1 = 4x^2 - 20x + 25 \Rightarrow 2x^2 - 16x + 24 = 0$$

$$x^2 - 8x + 12 = 0 \Rightarrow (x-2)(x-6) = 0 \Rightarrow x = 2, 6$$

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

$$2x = t \Rightarrow x = \frac{t}{2}$$

$$g(x-1) = \frac{1}{2}(x-1)^2 + 11 = \frac{1}{2}x^2 - \frac{1}{2}x + \frac{11}{2} \Rightarrow \frac{1}{2}x^2 - \frac{1}{2}x + \frac{11}{2} = \frac{-A}{Fa}$$

$$= \frac{1440 - 1220}{2} = \frac{220}{2} = 110 \quad \checkmark$$

$$f(x) = 2x - 4 \Rightarrow f(g(x)) = 2(2x^2 - 4x + 1) - 4 = 4x^2 - 8x - 2$$

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

$$g \circ f(x) = (2x-4)^2 - 2(2x-4) + 1 = 4x^2 - 16x + 16 - 4x + 8 + 1 = 4x^2 - 20x + 25$$

$$f - g = -(x+5) \Rightarrow 2f - 2g = 14 \Rightarrow 2f - 2g = 14$$

$$f - g = -x + 5 \Rightarrow -2f + 2g = 2x - 10$$

$$\Rightarrow f \circ g(x) = 2(2x-1) + 4 = 4x + 2$$

$$\Rightarrow f \circ g(a) = 0 \Rightarrow 4a + 2 = 0 \Rightarrow a = -\frac{1}{2}$$

$$f \circ g(x) = 9^{\log_9 x} = x^{\log_9 9} = x^1 \quad g \circ f(x) = \log_9 9^x = x \log_9 9 = 1x$$

$$x^1 \leq 1x \Rightarrow x^1 - 1x \leq 0 \Rightarrow \frac{x^1 - 1x}{x^1} = \frac{0}{x^1} = [0, 9] \Rightarrow$$

~~فقط يك ريشه~~

(دائريست)

$$\{1, 9\} \quad \text{اعداد}$$

$$x^1 + x - 1 - \frac{1}{x} + \frac{1}{x^1} = x - \frac{1}{x} + x^1 + \frac{1}{x^1} - 1 = \frac{x^1 - 1}{x} + \frac{x^1 + 1}{x^1} - 1$$

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

2

$$Df \circ g = \{x \mid x \in Dg, g \in Df\} \Rightarrow Dg = R, Df \Rightarrow x > 0$$

$$\Rightarrow -x^1 + 1x > 0 \Rightarrow \frac{-x^1 + 1x}{-x^1} \Rightarrow (0, 1) \Rightarrow Df \circ g = (0, 1) = A$$

$$Rg = (-\infty, 14] \Rightarrow \log_9 = \log_9 \left[\frac{-\infty}{9}, 14 \right] = [0, 4] \Rightarrow Rf \circ g = [0, 4] = B$$

$$A \cap B = [0, 1) \cap [0, 4] = [0, 4] = \{1, 9, 27, 81\} \quad \text{كثير}$$

$$f(f(x)) = 1 - 3f(x) \Rightarrow f(t) = 1 - 3t^1 \Rightarrow f(x) = 1 - 3x^1$$

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

$$x^1 - 2x^1 + 2x - 1 = 1 - 3x^1 \Rightarrow x^1 + 2x - 3 = 0 \Rightarrow p(x) = x^1 + 2x - 3$$

$$p'(x) = 1x^1 + 2 \Rightarrow \text{فقط يك ريشه} \Rightarrow \boxed{\text{فقط يك ريشه}}$$

2

$$g(1) = 1 \Rightarrow x - \frac{1}{x} = 1 \Rightarrow \frac{x^1 - 1}{x} = 1 \Rightarrow x^1 - 1x - 1 = 0 \Rightarrow (x-1)(x+1) = 0$$

$$x = 1 \Rightarrow g(1) \Rightarrow g(f(-1)) = -a + 1 = 1 \Rightarrow -a = 0 \Rightarrow \boxed{a = 0}$$

$$g(1) \Rightarrow g(f(1)) = 1a + 1 = 1 \Rightarrow 1a = 0 \Rightarrow \boxed{a = 0}$$

$$x = 1 \rightarrow 1a + 1 = 1 \rightarrow a = 0$$

$$x = -1 \rightarrow -a - 1 = 1 \rightarrow a = -1$$