

$$f(x) = a^x$$

$$g(x) = \log_a x \rightarrow x > 0 \text{ ①}$$

$$\textcircled{1} \quad n(P) = (0, 2]$$

$$f \circ g(x) = f(\log_a x) = a^{\log_a x} = x^{\frac{1}{\log_a a}} = x^1 = x$$

$$g \circ f(x) = g(a^x) = \log_a a^x = x$$

$$f \circ g(x) \leq g \circ f(x) \Rightarrow x^1 \leq x \Rightarrow$$

$$x^1 - x \leq 0 \Rightarrow x(x-1) \leq 0 \Rightarrow 0 \leq x \leq 1$$

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

$$f(t) = t^2 + t \Rightarrow \boxed{f(x) = x^2 + x}$$

$$f \circ g = f(g(x)) = f(\ln x - x^2) = \log_a (\ln x - x^2)$$

$$\ln x - x^2 > 0 \Rightarrow x(\ln x - x) > 0 \quad \frac{0}{-1} \frac{1}{-} \Rightarrow \underline{A} = (0, 1), \underline{B} = \mathbb{R}$$

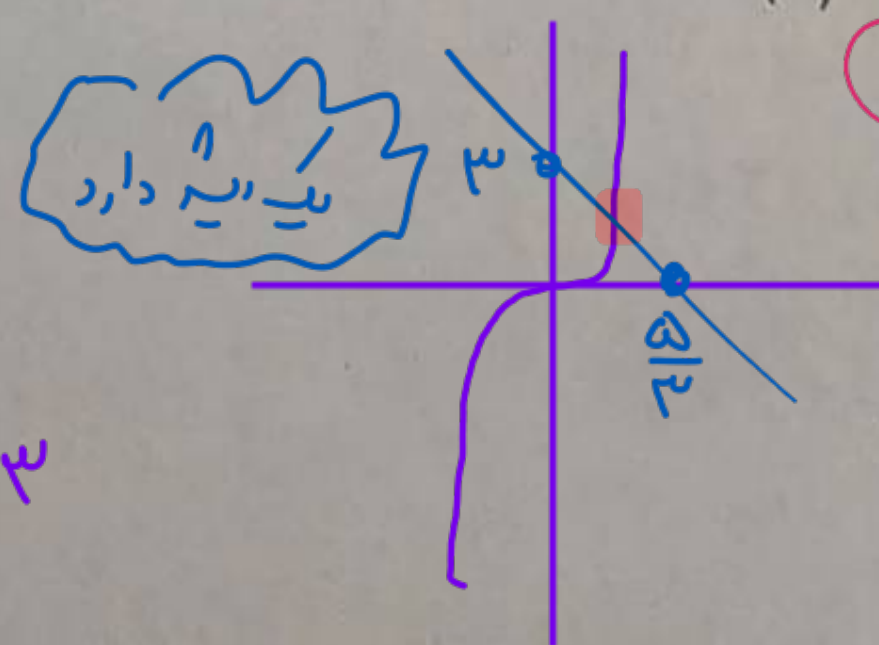
$$\boxed{A \cap B = (0, 1)}$$

$$R_g = (-\infty, 1] \xrightarrow{\log_a} (-\infty, 1] \rightarrow R_{f \circ g} = (-\infty, 1] \rightarrow A \cap B = (0, 1]$$

$$h(g(x)) = h(x-1) = (x-1)^3 + 2(x-1) + 1 = x^3 - 3x^2 + 3x - 1 + 2x - 2 + 1 = x^3 - 3x^2 + 5x - 1 = f(x)$$

$$f \circ f(n) = 1 - 3f^2(n) \rightarrow f(n) = 1 - 3n^2$$

$$n^2 + 2n - 3n^2 - 1 = 1 - 3n^2 \rightarrow n^2 = -2n + 3$$



$$f(x) = x - \frac{1}{x}$$

$$g \circ f(x) = a x^3 + 1 \quad \left\{ \begin{array}{l} g(f(x)) = g\left(x - \frac{1}{x}\right) = a x^3 + 1 \end{array} \right.$$

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

$$\text{If } x = 1 \Rightarrow 1^3 a + 1 = 1 \Rightarrow a = 0$$

$$\text{If } x = -1 \Rightarrow -1^3 a + 1 = 1 \Rightarrow a = 0$$