

$$\text{الف) } a^2 - 3 < (a^2 - 3)^2 \rightarrow a^2 - 3 < a^4 - 6a^2 + 9 \rightarrow 0 < a^4 - 7a^2 + 12 \rightarrow a^2 < (t-4)(t-3)$$

$$\therefore -\sqrt{3} < a^2 < 4$$

$$a^2 > 0 \rightarrow 0 < a^2 < 3$$

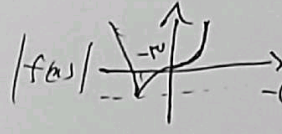
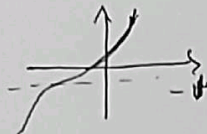
$$0 < (t-4)(t-3)$$

$$-\sqrt{3} < a^2 < \sqrt{3} \quad a^2 \neq 3 \quad +1 -1 +$$

$$a^2 \geq 4 \rightarrow a \geq 2, a \leq -2$$

6

$$f(x) = (x+3)^3 - 1 \rightarrow$$



$$[-3, +\infty) \Rightarrow \text{أبداً صوري} \Rightarrow x = -3$$

~~0~~ ~~0~~

7

$$f(x) = (\sqrt{x} - 1)^2 \rightarrow \text{أبداً صوري} \rightarrow x \geq 0$$

$$x \geq 0 \rightarrow 0 \leq x \leq 1$$

$$f \circ f(x) \leq f(\sqrt{x}) \rightarrow f(x) \leq \sqrt{x} \rightarrow x + \sqrt{x} - 2 \leq \sqrt{x} \rightarrow x \leq 2$$

8

$$\cos \theta = 1 \rightarrow \frac{\sqrt{a-1}}{2} - \frac{\sqrt{1-a}}{2} = 2 - \frac{1}{2} = \frac{12}{2} = 6$$

$$\min \cos \theta = \frac{\sqrt{a-1}}{2} - \frac{\sqrt{1-a}}{2} = \frac{1}{2} - 2 = -\frac{3}{2} = -a$$

$$\frac{10}{2} - \left(2 - \frac{3}{2}\right) = \frac{11}{2}$$

9

$$f(x) = x - [x] + 5 \rightarrow R_f = [5, 6)$$

$$g(x) = \frac{x - [x]}{2} \rightarrow \begin{cases} \frac{5-1}{2} = \frac{4}{2} = 2 \\ \frac{6-1}{2} = \frac{5}{2} = 2.5 \end{cases}$$

$$R_{g \circ f} = \left[\frac{18}{2}, \frac{25}{2} \right)$$

10