

$$\frac{2}{3} < 1 \quad \cot \frac{\pi}{3} = \cot 60^\circ = \sqrt{3}$$

$$\sqrt{3} > 1 \rightarrow f \circ f\left(\frac{2}{3}\right) = 2$$

$$f\left(\frac{2}{3}\right) = \sqrt{3}$$

$$f\sqrt{3} = \sqrt{3+1} = 2$$

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$$g\left(\frac{\pi}{3}\right) = 2 \cos^2 \frac{\pi}{3} = \frac{1}{2} \quad f\frac{1}{2} = \sqrt{-\frac{1}{2} + 1} = \frac{\sqrt{2}}{2}$$

$$f_x = \sqrt{\frac{\frac{x}{2}-1}{\frac{1}{x^2}}} = \sqrt{\frac{\frac{x-x}{2}}{\frac{1}{x^2}}} = \sqrt{-x^2 + 2x} \quad f \circ g\left(\frac{\pi}{3}\right) = \frac{\sqrt{2}}{2}$$

(الف)

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$$g(\sqrt{2}) = \frac{\sqrt{2}}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}} = -(2+\sqrt{2})$$

$$f(-(2+\sqrt{2})) = [-2-\sqrt{2}] = -2-\sqrt{2}$$

$$f \circ g(\sqrt{2}) = -2-\sqrt{2}$$

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(ب)

$$f\left(\frac{\pi}{4}\right) = \frac{1+\sqrt{2}}{2}$$

$$g\left(\frac{\sqrt{2}}{2}\right) = \frac{1}{\frac{\sqrt{2}}{2}} \times \sqrt{1-\frac{1}{2}} = \frac{1}{\frac{\sqrt{2}}{2}}$$

$$\rightarrow g \circ f\left(\frac{\pi}{4}\right) = \frac{1}{\frac{\sqrt{2}}{2}}$$

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$$\text{الف) } f \circ g(x) = \{(1, \omega), (2, \omega), (4, 13), (8, 13)\}$$

$$\text{ب) } g \circ f(x) = \{\} = \emptyset$$

$$\text{ج) } f \circ f(x) = \emptyset$$

$$\text{د) } g \circ g(x) = \{(1, 1), (2, 4), (4, 10)\}$$

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$$a = 1 \quad b = \omega$$

$$(1, \omega)$$

$$(1, \omega) f \circ g \rightarrow 1 \rightarrow 2 \rightarrow 1$$

$$a = 1$$

$$(1, \omega) g \circ f \rightarrow$$

$$1 \rightarrow b(\omega) \rightarrow 1$$

$$b = \omega$$

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$$f(x) = a(x\sqrt{x} - 1)(x\sqrt{x} - \sqrt[4]{2})$$

$$\begin{aligned} \text{LCM} \Rightarrow x\sqrt{x} &= 1 \rightarrow x=1 \\ x\sqrt{x} &= \sqrt[4]{2} \rightarrow x=\sqrt[4]{2} \end{aligned} \rightarrow |p-1| = 1$$