

$$1) f\left(\frac{\pi}{2}\right) = \cot \frac{\pi}{2} = 0 \quad \pi = \cot \frac{\pi}{4} = \sqrt{3} \quad f \circ f\left(\frac{\pi}{2}\right) = \sqrt{3}$$

$$f(\sqrt{3}) = \sqrt{(\sqrt{3})^2 + 1} = \sqrt{4} = 2$$

(5)

$$2) \text{ ا) } g\left(\frac{\pi}{2}\right) = \frac{1}{2} \rightarrow \frac{1}{x} = \frac{1}{\frac{1}{2}} \rightarrow x = 2 \rightarrow f(x) = 2$$

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

(5)

$$b) g(\sqrt{2}) = \frac{\sqrt{2}}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}} = \frac{\sqrt{2}+2}{-1} = -2-\sqrt{2} \rightarrow f(-2-\sqrt{2}) = [-2-\sqrt{2}]$$

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

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

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

(5)

$$4) f \circ g(x) = [(x, \omega), (y, \omega), (x, y), (y, \omega)]$$

$$g \circ f(x) = \emptyset \quad f \circ f(x) = \emptyset$$

$$g \circ g(x) = [(x, 1), (y, y), (y, 1)]$$

(5)

$$a) a \rightarrow y \rightarrow x \quad (a, y) = (x, y) \Rightarrow a = x$$

$$x \rightarrow \omega \rightarrow 1 \quad (b, 1) = (\omega, 1) \Rightarrow b = \omega$$

$$(a, b) = (x, \omega)$$

(5)

$$y) f(f(a)) = a(a+1)+1 = 2a+1$$

$$g\left(\frac{1}{x}\right) = \frac{1}{x^2-1} \rightarrow g(x) = \frac{x^2-1}{x^2-1} = 1$$

$$g \circ f(-1) = \frac{1}{(-1)^2-1} = \frac{1}{0} \rightarrow \text{undefined}$$

$$g(-1) = \frac{1}{(-1)^2-1} = \frac{1}{0} \rightarrow \text{undefined}$$

$$g \circ f(-1) = -1$$

(5)

$$f(x) = \sqrt{x+1} \rightarrow D_{g \circ f} = [x \in D_f, f(x) \in D_g]$$

$$D_{g \circ f} = [x \in D_f, f(x) \in D_g] \rightarrow x \neq -1$$

$$D_{g \circ f} = (-1, +\infty) - \{-1\}$$

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$$A) (f \circ g) \circ f \rightarrow [0, 1] \cup (\sqrt{1-x^2}) = [-1, 1]$$

$$\sqrt{1-x^2} + \sqrt{x} \rightarrow \sqrt{1-x^2} \rightarrow \sqrt{1-x^2} = 1$$

$$-1 \leq x \leq 1 \rightarrow \sqrt{1-x^2} = 1$$

(5)

$$Q) \text{ ا) } \frac{x^2+1}{x-1} = x \rightarrow x^2+1 = x(x-1) = x^2-x-1$$

$$x(x-1) = x^2-x-1 \rightarrow x^2-x-1 = x^2-x-1$$

$$f(x) = x^2-x-1$$

$$f(4) = 4^2-4-1 = 15$$

(5)

$10 \left| \begin{aligned} &g(f(x)) = 0 \longrightarrow f(x) = 1 \\ &\sqrt[4]{16\sqrt{x}} \\ &x_2 - x_1 = 2 - 1 = 1 \end{aligned} \right.$

$f(x) = 1$
 $x\sqrt{x} = 1$
 $x = 1$

$\leq f(x) = 2\sqrt{x}$
 $x\sqrt{x} = 2\sqrt{x}$
 $x = 2$

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