

$$f(x) = \begin{cases} \cot \frac{\pi x}{\varepsilon} ; x \leq 1 \\ \sqrt{x^2 + 1} ; x > 1 \end{cases}$$

① $\frac{\pi}{\varepsilon} \rightarrow \frac{\pi}{9} \Rightarrow \cot \frac{\pi}{9} \rightarrow \cot 60^\circ = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

② $\frac{\sqrt{3}}{3} > 1 \rightarrow \frac{3}{9} + \frac{9}{9} = \frac{12}{9} \Rightarrow \sqrt{\frac{12}{9}} = \frac{\sqrt{12}}{3}$

$f \circ f \left(\frac{\pi}{\varepsilon} \right) = ?$
 $\hookrightarrow \frac{\sqrt{12}}{3}$

* $f \circ g \left(\frac{\pi}{\varepsilon} \right) \rightarrow \frac{\pi}{\varepsilon} = 30^\circ \rightarrow g(x) = r \cos 30^\circ \rightarrow r \left(\frac{\sqrt{3}}{2} \right)^2 = r \left(\frac{3}{4} \right) = \frac{3}{4}$

$\frac{1}{\frac{3}{4}} = \frac{4}{3} \rightarrow \sqrt{\frac{\frac{4}{3} - 1}{\frac{3}{4}}} = \sqrt{\frac{\frac{1}{3}}{\frac{3}{4}}} = \sqrt{\frac{4}{9}} = \frac{2}{3}$

* $g(x) = \frac{x}{1-x} \Rightarrow \frac{\sqrt{2}}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}} = \frac{\sqrt{2}+\sqrt{2}}{-1} = -2\sqrt{2} \rightarrow [-2\sqrt{2}] = [-2, -] = \boxed{-4}$

$f(x) = \sin x \xrightarrow{①} \sin \frac{\pi}{\varepsilon} = \sin 45^\circ = \frac{\sqrt{2}}{2}$

$g(x) = x \sqrt{1-x^2} \xrightarrow{②} \frac{\sqrt{2}}{2} \sqrt{1 - \frac{1}{2}} = \frac{\sqrt{2}}{2} \times \frac{1}{\sqrt{2}} = \frac{1}{2}$

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

$f(x) = \{(1, 5), (4, 5), (8, 12), (10, 12)\}$ $g(x) = \{(1, 4), (2, 5), (4, 8), (8, 10)\}$

الف) $f \circ g(x) = \{(1, 5), (2, 5), (4, 12), (8, 12)\}$

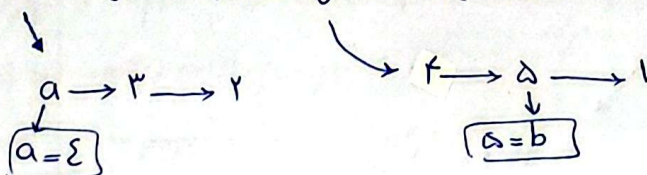
ب) $g \circ f(x) = \emptyset$

ج) $f \circ f(x) = \emptyset$

د) $g \circ g(x) = \{(1, 8), (2, 4), (4, 10)\}$

$f = \{(1, 1), (2, 2), (3, 5), (4, 6)\}$ $g = \{(1, 2), (2, 1), (3, 3), (4, 1)\}$

$(1, 2) \in f \circ g$, $(1, 1) \in g \circ f$ $(a, b) = ?$



$(1, 5)$

$$f(x) = ax + b \rightarrow f(f(x)) = a^2x + ab + b = 3x + 4 \rightarrow a = \pm 3$$

$$g(3x+3) = 3x-3$$

$$3x+3 = t \rightarrow 3x = t-3 \rightarrow \frac{3t-9}{3} = \frac{t-3}{1} = \frac{3t-13}{3}$$

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

$$3x+1 \rightarrow -3+1 = -2 \checkmark \Rightarrow \frac{3(-1)-13}{3} = \frac{-14}{3} = -\frac{14}{3}$$

$$-3x-3 \rightarrow 3-3 = 0 \checkmark$$

$$b(a+1) = 3 \rightarrow a = 2, b = 1$$

$$a = -2, b = -3$$

$$3x+1, -3x-3$$

$$f(x) = \sqrt{x+|x|} \quad g(x) = \frac{1}{x^2-4x} \quad Dg \circ f = ?$$

$$\begin{cases} x=0 \rightarrow \sqrt{0} = 0 \\ x>0 \rightarrow \sqrt{x} > 0 \\ x<0 \rightarrow \sqrt{0} = 0 \end{cases}$$

$$D_f = \mathbb{R}$$

$$x^2-4x=0 \rightarrow x(x-4)=0 \rightarrow x=0 \text{ or } x=4$$

$$x \leq 0$$

$$\Rightarrow Dg \circ f = (0, +\infty) - \{4\}$$

$$\sqrt{x+|x|} = 4 \rightarrow x+|x| = 16 \rightarrow x = 8$$

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

$$g(x) = \sqrt{x} \rightarrow x \geq 0$$

$$D_{(f+g) \circ f} = \{x \mid 1 \geq x \geq 0\} = (0, 1]$$

$$\text{الف) } \frac{3x+1}{x-2} = t \rightarrow 3x+1 = tx-2t \rightarrow x(3-t) = -1-2t \Rightarrow x = \frac{-1-2t}{3-t}$$

$$\rightarrow tx + \Delta \Rightarrow \frac{3-11t}{t-3} + \Delta \Rightarrow \frac{3-11t}{t-3} + \Delta$$

$$\text{ب) } f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2} \rightarrow \left(x + \frac{1}{x}\right)^2 = x^2 + 3 + \frac{1}{x^2} \Rightarrow x^2 + \frac{1}{x^2} + 3\left(x + \frac{1}{x}\right)$$

$$\text{برای } x: x^2 + \frac{1}{x^2} + 3\left(x + \frac{1}{x}\right) - 3\left(x + \frac{1}{x}\right) \rightarrow t^2 - 3t \Rightarrow x^2 - 3x$$

$$g(f(x)) = 0 \rightarrow f(x) = g(x) \text{ (slowly)}$$

$$f(x) = 1, 2\sqrt{x} = f(x) \rightarrow f(x) = x\sqrt{x}$$

$$f(x) = 1 \rightarrow x = 1, f(x) = 2\sqrt{x} \rightarrow x = 2$$

$$x-1 = 1$$