

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

$$x < 1$$

$$x > 1$$

$$\sqrt{x^2+1}$$

$$x > 1$$

$$x = \frac{1}{e} \rightarrow$$

$$f\left(\frac{1}{e}\right) = \frac{\frac{1}{e}+1}{\frac{1}{e}} = \frac{1+e}{1} = 1+e$$

$$x = \frac{1}{e}$$

$$f\left(\frac{1}{e}\right) \rightarrow \sqrt{\left(\frac{1}{e}\right)^2+1} = 1 \checkmark$$

$$f\left(\frac{1}{e}\right) = f\left(f\left(\frac{1}{e}\right)\right)$$

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

$$g(x) = 2 \cos x$$

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

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$$g\left(\frac{\pi}{2}\right) = 2\left(\frac{1}{2}\right) = 1 \rightarrow f\left(\frac{1}{2}\right) = \sqrt{\frac{\frac{1}{4}-1}{\frac{1}{4}}} = \sqrt{\frac{-3}{1}} = \sqrt{-3}$$

$$f(x) = [x] \quad g(x) = \frac{x}{1-x} \quad f\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = \left[\frac{\sqrt{2}}{1-\sqrt{2}}\right] = [-2.414] = -3$$

$$f \circ g\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = [-2.414] = -3 \checkmark$$

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

$$g\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = \frac{\frac{\sqrt{2}}{1-\sqrt{2}}}{1-\frac{\sqrt{2}}{1-\sqrt{2}}} = \frac{\sqrt{2}}{1-\sqrt{2}-1+\sqrt{2}} = \frac{\sqrt{2}}{0} \rightarrow \frac{1}{2} \rightarrow g\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = \frac{1}{2}$$

$$f\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = \sin\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = \frac{\sqrt{2}}{2}$$

$$g \circ f\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = g\left(\frac{\sqrt{2}}{1-\sqrt{2}}\right) = \frac{1}{2} \checkmark$$

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$$f: \mathbb{R} \rightarrow \mathbb{R} \quad g: \mathbb{R} \rightarrow \mathbb{R}$$

الف) $4 \rightarrow 8 \rightarrow 12$
 $8 \rightarrow 16 \rightarrow 24$

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

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ب) $1 \rightarrow 5 \rightarrow \emptyset$
 $4 \rightarrow 8 \rightarrow \emptyset$
 $8 \rightarrow 16 \rightarrow \emptyset$
 $16 \rightarrow 32 \rightarrow \emptyset$

$$g \circ f = \emptyset \checkmark$$

ج) $\emptyset$
 د) $\{(4,8), (8,16), (16,32)\}$

$$f: \{1,2,3,4\} \rightarrow \{a,b\} \quad g: \{a,b\} \rightarrow \{c,d\}$$

$$f \circ g: \{c,d\} \rightarrow \{a,b\}$$

$$c \rightarrow a \rightarrow 2 \rightarrow a \rightarrow c$$

$$(a,c) \rightarrow a \rightarrow c \checkmark$$

$$c \rightarrow b \rightarrow 1 \rightarrow b \rightarrow d$$

$$b \rightarrow d \checkmark$$

$$(a,b) = (f \circ g) \checkmark$$

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$$f(a) = a \rightarrow f \circ f(a) = a \quad (a \mapsto a) \mapsto a$$

$$\#. \quad \begin{matrix} \text{For } a \text{ and } b \text{ in } A \\ n = k-1 \end{matrix} \left\{ \begin{matrix} a_s \pm r \\ a_b \pm b_s \end{matrix} \right\} \rightarrow \left\{ \begin{matrix} r_n + c_{n-1} \\ n_s - r \end{matrix} \right\}$$

[illegible]

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

$$f(x) = \sqrt{x+1} \rightarrow f(x) = \begin{cases} \sqrt{x+1} & x \leq 0 \\ x & x > 0 \end{cases} \rightarrow D_f = \mathbb{R} \checkmark$$

$$g(n) = \frac{1}{n^2 - f(n)} = 0 \quad f(n) \neq 0 \quad \checkmark \quad f(n) \neq f \quad \checkmark$$

$$f(n) = 0 \rightarrow n = 0 \quad f(n) = 5 \rightarrow n = 14 \quad n = 14 \quad n = 1$$

$$Dg \subseteq \{a \in Df, f(a) \in Dg\} = (f \cdot \text{id}) \cup (\text{id} \cdot \omega) = (f \cdot \omega) \cup \{x\}$$

$$f(x) = \sqrt{1-x^2} \quad g(x) = \sqrt{x}$$

$$(f \circ g) \circ h = f(g(h)) = f(h(g(n)))$$

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

$$-1 \leq \alpha \leq 1 \quad D_f[-1, 1]$$

$$D_g = [0, +\infty)$$

$$D_{f,g} = [0, 1]$$

$$D = \{r \in D_f, f_m \in D_{f+g}\}$$

(2) $\lim_{x \rightarrow 0} \sqrt{1-x^2} = 1 \rightarrow \lim_{x \rightarrow 0} f(x) = 1 \rightarrow [-1, 1]$

$$g \circ f(x) = g(f(x)) = 2549$$

$$g(f(n)) \rightarrow \begin{cases} f(n) \text{ if } n \text{ is odd} \\ f(n) + 1 \text{ if } n \text{ is even} \end{cases}$$

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