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Subject:

بازم و فرست

آب و شستن

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

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

$$f(f(\frac{1}{2})) =$$

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

$$f(\sqrt{2}) = \sqrt{2} = \textcircled{B}$$

$$\text{الف) } f\left(\frac{1}{a}\right) = \sqrt{\frac{ra-1}{a^2}} \quad g(x) = r \cos^2 x$$

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

$$g\left(\frac{\pi}{2}\right) = r \cos^2 \frac{\pi}{2} = r \times \frac{1}{4} = \frac{1}{4}$$

$$f\left(\frac{1}{a}\right) = f\left(\frac{1}{4}\right)$$

$$a = r \quad f(r) = \sqrt{\frac{r-1}{r}} = \frac{\sqrt{r}}{r}$$

$$\text{ب) } f(x) = [x]$$

$$g(x) = \frac{x}{1-x}$$

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

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

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

$$f(x) = \sin x$$

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

$$g(x) = a\sqrt{1-x}$$

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

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

$$f(x) = \{(1, \omega) (2, \omega) (4, 1) (1, 1)\}$$

$$g(x) = \{(1, 4) (2, 4) (4, 1) (1, 1)\}$$

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

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

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

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

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$$f = \{(1,0), (1,1), (1,2), (1,3)\}$$

$$g = \{(1,0), (1,1), (1,2), (1,3)\}$$

$$(1,0) \in f \circ g$$

$$g(x) = 1$$

$$\rightarrow f(x) = 1 \rightarrow x = 1 \rightarrow a = 1 \rightarrow a = f$$

$$(1,1) \in g \circ f$$

$$g(f(x)) = 1$$

$$\rightarrow f(x) = 1 \rightarrow (1,0) \rightarrow b = 0$$

$$(1,2) \in ? \rightarrow (1,2)$$

$$f \circ g \rightarrow k$$

$$f(x) = x+1 \rightarrow g(f(-1)) = -1 \quad -4$$

$$f(f(x)) = x+2$$

$$f(x) = -x-1 \rightarrow g(f(-1)) = -1$$

$$g(x+1) = x+1$$

$$f(f(x)) = a(a+b) + b = a^2x + ab + b = f(x) + b$$

$$g \circ f(-1) = 0$$

$$a^2 = 1$$

$$a = \pm 1 \begin{cases} a = 1 \rightarrow b = 1 \\ a = -1 \rightarrow b = -1 \end{cases}$$

$$g(x) = cx + d$$

$$g(x) = cx + d$$

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

$$\frac{1}{1}x - \frac{1}{1}$$

$$g(x+1) = c(x+1) + d = x+1 \quad d = -\frac{1}{1}$$

$$d = -\frac{1}{1}$$

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

$$f(x) = \begin{cases} \sqrt{x} & x \geq 0 \\ 0 & x \leq 0 \end{cases}$$

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

$$D_f = \mathbb{R}$$

$$D_{g \circ f} = ?$$

$$\sqrt{x+1} \neq 0 \rightarrow x \neq -1$$

$$\sqrt{x+1} \neq 1 \rightarrow x \neq 0$$

$$D_g = \mathbb{R} - \{0, 1\}$$

$$\sqrt{x+1} \neq \{0, 1\} \rightarrow D_{g \circ f} = (0, +\infty) - \{1\}$$

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

$$\{u \in D_f, f(u) \in D_{f+g}\}$$

$$g(x) = \sqrt{x}$$

$$\sqrt{1-x^2} \in [0,1] \Rightarrow 0 \leq \sqrt{1-x^2} \leq 1$$

$$D(f \circ f + g \circ f) = ?$$

$$-1 \leq x \leq 1$$

$$0 \leq 1-x^2 \leq 1$$

$$D_f = \frac{-1+1}{-1+1} = 0$$

$$D_f = [-1, 1]$$

$$D_{f+g} = D_f \cap D_g = \boxed{[0,1]}$$

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

$$[-1,1] \cap [0, +\infty) \rightarrow [0,1]$$

$$\text{اذا } f\left(\frac{x+1}{x-1}\right) = x+a$$

$$\Rightarrow f\left(x+\frac{1}{x}\right) = x^2 + \frac{1}{x^2} + a$$

$$f(x) = ? \quad \frac{x+1}{x-1} = t$$

$$f(x) = ? \quad \left(x+\frac{1}{x}\right) = t$$

$$f(t) = f\left(\frac{t+1}{t-1}\right) + a$$

$$t^2 + \frac{1}{t^2} + a$$

$$x = \frac{t+1}{t-1}$$

$$\rightarrow f(x) = \frac{x^2-1}{x-1}$$

$$x^2 + \frac{1}{x^2} = t^2 - \frac{1}{t^2}$$

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

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

$$a_1 = 1$$

$$a_1' - a_1' = 1 - 1 = 0$$

$$g(f(x)) = 0$$

$$g(a_1) = 0$$

$$a_1 = 1$$

$$a_1' - a_1' = 1 - 1 = 0$$

$$f(x) \begin{cases} x \geq 1 \rightarrow x\sqrt{x} = 1 \rightarrow a_1' = 1 & a_1 = 1 \\ x < 1 \rightarrow x\sqrt{x} = 1 \rightarrow a_1' = 1 \end{cases}$$