

سوال نمبر ۱۹۰ (۱۹۰) بلکہ محمد حسین

$$f(n) = \begin{cases} c \cdot \frac{\pi^n}{\varepsilon} & n \leq 1 \\ \sqrt{n^2+1} & n > 1 \end{cases}$$

$$f \circ f\left(\frac{\pi}{\varepsilon}\right)?$$

$$c \cdot \frac{\pi}{\varepsilon} \left(\frac{\pi}{\varepsilon}\right) \rightarrow c \cdot \frac{\pi}{\varepsilon} = \sqrt{2}$$

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

$$f(f(\frac{\pi}{\varepsilon})) = f(\sqrt{2})$$

$$\hookrightarrow \sqrt{(\sqrt{2})^2+1} = 2 \rightarrow f \circ f\left(\frac{\pi}{\varepsilon}\right) = 2$$

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

$$g(n) = 2c \cdot s^n(n) \rightarrow g\left(\frac{\pi}{\varepsilon}\right) = 2c \cdot s^n\left(\frac{\pi}{\varepsilon}\right) \rightarrow 2\left(\frac{1}{\varepsilon}\right)^2 = \frac{2}{\varepsilon^2}$$

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

$$f\left(\frac{1}{n}\right) = f\left(\frac{1}{\varepsilon}\right) = a = 2$$

$$f\left(\frac{1}{\varepsilon}\right) = \sqrt{\frac{2(\frac{1}{\varepsilon})-1}{(\frac{1}{\varepsilon})^2}} = \sqrt{\frac{0}{\frac{1}{\varepsilon^2}}} \rightarrow \sqrt{0} = 0$$

$$f(n) = [n]$$

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

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

$$g(n) = \frac{n}{1-n}, \quad f \circ g(\sqrt{2}) = ?$$

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

$$\sqrt{2} \approx 1.41$$

$$f(g(\sqrt{2})) = [-1.41, -3.41] = [-3.41, -1.41] = -\varepsilon$$

$$f(n) = \sin n$$

$$g(n) = n \sqrt{1-n^2}$$

$$g(f(\frac{\pi}{\varepsilon})) \rightarrow f(\frac{\pi}{\varepsilon}) = \sin(\frac{\pi}{\varepsilon}) = \frac{\sqrt{2}}{\varepsilon}$$

$$g(\frac{\sqrt{2}}{\varepsilon}) = \frac{\sqrt{2}}{\varepsilon} \sqrt{1 - (\frac{\sqrt{2}}{\varepsilon})^2} \rightarrow \frac{\sqrt{2}}{\varepsilon} \sqrt{\frac{\varepsilon^2-2}{\varepsilon^2}} = \frac{\sqrt{2}}{\varepsilon} \times \frac{\sqrt{\varepsilon^2-2}}{\varepsilon} = \frac{\sqrt{2}}{\varepsilon^2} = \frac{1}{\varepsilon^2}$$

$$f(n) = \left\{ (\varepsilon, \Delta), (2, \Delta), \left(1 - \frac{\varepsilon}{\varepsilon}, \frac{\varepsilon}{\varepsilon}\right), (1, 12) \right\}$$

$$g(n) = \left\{ (\varepsilon, 4), (2, \varepsilon), (2, n), (1, 1) \right\}$$

$$f \circ g \rightarrow \begin{matrix} \varepsilon \xrightarrow{g(n)} 4 \xrightarrow{f(n)} \Delta \\ 2 \xrightarrow{g(n)} \varepsilon \xrightarrow{f(n)} \Delta \\ 4 \xrightarrow{g(n)} 1 \xrightarrow{f(n)} 12 \\ 1 \xrightarrow{g(n)} 1 \xrightarrow{f(n)} 12 \end{matrix} \rightarrow \left\{ (\varepsilon, \Delta), (2, \Delta), (4, 12), (1, 12) \right\}$$

$$g \circ f \rightarrow \begin{matrix} \varepsilon \rightarrow \Delta \rightarrow - \\ 4 \rightarrow \Delta \rightarrow - \\ 1 \rightarrow 12 \rightarrow - \\ 1 \rightarrow 12 \rightarrow - \end{matrix} \rightarrow \emptyset$$

$$f \circ g \rightarrow \begin{matrix} \varepsilon \rightarrow \Delta \rightarrow - \\ 4 \rightarrow \Delta \rightarrow - \\ 1 \rightarrow 12 \rightarrow - \\ 1 \rightarrow 12 \rightarrow - \end{matrix} \rightarrow \emptyset$$

$$g \circ g \rightarrow \begin{matrix} \varepsilon \rightarrow 4 \rightarrow 1 \\ 2 \rightarrow \varepsilon \rightarrow 4 \\ 4 \rightarrow 1 \rightarrow 1 \\ 1 \rightarrow 1 \rightarrow - \end{matrix} \rightarrow \left\{ (\varepsilon, 1), (2, 4), (4, 1) \right\}$$

مسئله

سوال ۱

$$(f \circ g)(\varepsilon) = r \rightarrow f(g(\varepsilon)) = r$$

$$\underbrace{g(\varepsilon)}_K$$

$$f(K) = r \rightarrow f(r) = r \implies g(\varepsilon) = r \implies (\varepsilon, r) \in g$$

$$(a, r), (b, 1) \rightarrow (a, r) \cup (b, 1) \rightarrow (a, r) \rightarrow a = \varepsilon$$

$$g \circ f(\varepsilon) = 1 \rightarrow g(\underbrace{f(\varepsilon)}_a) = 1 \rightarrow g(a) = 1 \rightarrow (b, 1) \cup (a, 1) \rightarrow b = a$$

$$(a, b) = (\varepsilon, a)$$

$$f(f(m)) = \varepsilon m + r$$

$$g(rm + r) = r^2 m - r$$

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

$$f(m) = am + b$$

$$g(m) = m^2 + n$$

$$f(am + b) = a(am + b) + b = a^2 m + ab + b$$

$$a^2 m + ab + b = \varepsilon m + r$$

$$a^2 = \varepsilon \rightarrow a = \pm r$$

$$a = r \rightarrow ab + b = r \rightarrow rb + b = r \rightarrow rb = r \rightarrow b = 1 \rightarrow r(m+1)$$

$$a = -r \rightarrow -rb + b = r \rightarrow -b = r \rightarrow b = -r \rightarrow -r(m-r)$$

$$g(rm + r) = m(rm + r) + n \Rightarrow r^2 m + rm + n = r^2 m - r$$

$$rm = r \rightarrow m = \frac{r}{r}$$

$$rm + n = -r \rightarrow \frac{r}{r} + n = -r \rightarrow n = -\frac{1r}{r}$$

$$g(m) = \frac{r}{r} m - \frac{1r}{r}$$

$$\begin{cases} f(-1) = r(-1) + 1 = -1 \\ g(-1) = \frac{r}{r}(-1) - \frac{1r}{r} = -1 \end{cases}$$

$$\boxed{g \circ f(-1) = -1}$$

$$\begin{cases} -rm - r \\ f(-1) = -1 \\ g(-1) = -1 \end{cases}$$

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

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

$$D = g \circ f = ?$$

$$g \circ f(m) = g(f(m)) = \frac{1}{(f(m))^2 - \varepsilon f(m)}$$

$$m + |m| \geq 0 \begin{cases} m \geq 0 & |m| = m & m + |m| = 2m \geq 0 \\ m < 0 & |m| = -m & m + |m| = 0 \end{cases}$$

$$D_{g \circ f} = m \geq 0 \cup \{m < 0 \mid m + |m| = 0\} = \{0\} \cup \{., +\infty\} = [0, +\infty)$$

$$t = 0 \rightarrow f(m) = 0 \quad m = 0 \quad \text{چون}$$

$$t = \varepsilon \rightarrow f(m) = \varepsilon \quad m = 1 \quad \sqrt{rm} = \varepsilon \rightarrow rm = 14 \rightarrow m = 14 \quad \text{چون}$$

$$D_{g \circ f} = [0, +\infty) \setminus \{1\}$$

سوال ۷

۲)

$$\begin{cases} t \neq 0 \\ t \neq \varepsilon \end{cases}$$

$$f(n) = \sqrt{1-n^r}$$

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

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

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$$f(f(n)) + g(f(n)) = \sqrt{1-(f(n))^r} + \sqrt{f(n)}$$

$$1-(f(n))^r > 0$$

$$f(n) \sqrt{1-n^r} \rightarrow (f(n))^r = 1-n^r$$

$$1-(f(n))^r = 1-(1-n^r) = n^r > 0$$

$$g(f(n)) = \sqrt{f(n)} = \sqrt{\sqrt{1-n^r}}$$

$$\sqrt{1-n^r} > 0$$

$$1-n^r > 0 \rightarrow -1 \leq n \leq 1 \rightarrow D = [-1, 1]$$

$$f\left(\frac{r_{m+1}}{n-r}\right) = \varepsilon_{m+1} + \Delta$$

$$t = \frac{r_{m+1}}{n-r}$$

$$t_{n-r} = r_{m+1}$$

$$n(t-r) = r_{m+1}$$

$$n = \frac{r_{m+1}}{t-r}$$

$$\rightarrow \varepsilon\left(\frac{r_{m+1}}{t-r}\right) + \Delta \rightarrow f(t) = \frac{\Lambda t + \varepsilon}{t-r} + \Delta$$

$$f\left(n + \frac{1}{n}\right) = n^r + \frac{1}{n^r}$$

$$t = n + \frac{1}{n}$$

$$f(t) = \frac{\Lambda t + \varepsilon}{t-r} + \frac{\Delta(t-r)}{t-r} \rightarrow \frac{\Lambda r_{m+1} - 1}{n-r} = f(n)$$

$$n^r + \frac{1}{n^r} = \left(n + \frac{1}{n}\right)^r - r\left(n + \frac{1}{n}\right) \rightarrow n^r + \frac{1}{n^r} = t^r - r t$$

$$f(t) = t^r - r t \rightarrow f(n) = n^r - r n$$

$$g(1) = 0$$

$$g(r\sqrt{r}) = 0$$

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$$(g \circ f)(n) = g(f(n)) = 0 \rightarrow f(n) = g$$

$$f(n) = n^{\frac{r}{r-1}} \geq 1$$

$$n^{\frac{r}{r-1}} = r\sqrt{r}$$

$$n^{\frac{r}{r-1}} \geq 1 \rightarrow n \geq 1^{\frac{r-1}{r}}$$

$$n^{\frac{r}{r-1}} = r\sqrt{r} \rightarrow n = (r\sqrt{r})^{\frac{r-1}{r}}$$

$$g(f(n)) = 0$$

$$r \times r^{\frac{1}{r}} = r^{\frac{r}{r-1}}$$

$$\rightarrow \left(r^{\frac{r}{r-1}}\right)^{\frac{r-1}{r}} = r$$

$$n = \frac{1}{r-1} \quad n = \frac{r}{r-1}$$

$$r-1 = 1$$