

$$f \circ f(m) = \{m + r \rightarrow a(am + b) + b = ar + ab + b = \{m + r \rightarrow ar = \{ \rightarrow a = r - r$$

$$\begin{aligned} a = r &\rightarrow b = 1 \rightarrow \textcircled{1} f(m) = rn + 1 \\ a = -r &\rightarrow b = -r \rightarrow \textcircled{2} f(m) = -rn - r \end{aligned}$$

$$\textcircled{1} \rightarrow g \circ f(-1) = g(-1) \Rightarrow (rn + r = -1 \rightarrow r = -r) \Rightarrow g(-1) = r(-r) - r = \textcircled{-1}$$

$$\textcircled{2} \rightarrow g \circ f(-1) = g(-1) \checkmark$$

$$g \circ f(m)$$

$$f(m) \rightarrow \begin{cases} x \geq 0; \sqrt{rn} \\ x < 0; 0 \end{cases} \rightarrow D_f \in \mathbb{R}^+ \mid g(m) = \frac{1}{m(m-1)} \rightarrow D_g = \mathbb{R} - \{0, 1\}$$

$$\begin{aligned} \sqrt{m+1} \neq 0 &\rightarrow D_{g \circ f} \neq \mathbb{R}^{+0} \\ \sqrt{rn} \neq \{ \rightarrow rn \neq 1 \rightarrow n \neq 1 \rightarrow D_{g \circ f} = \mathbb{R}^+ \setminus \{1\} = (0, 1) \cup (1, +\infty) \end{aligned}$$

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

$$D_{(f+g)} = D_f \cap D_g = [-1, 1] \cap [0, +\infty) = [0, 1]$$

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

$$D_{(f+g) \circ f} = \{x \in D_f \mid f(m) \in D_{(f+g)}\} = \{x \in [-1, 1] \mid 0 \leq \sqrt{1-x^2} \leq 1\}$$

$$\rightarrow \underline{D_{(f+g) \circ f} = [-1, 1]}$$

$$\textcircled{1} \rightarrow f\left(\frac{rn+1}{n-r}\right) = \{m + r \rightarrow \frac{rn+1}{n-r} = t \rightarrow r = -\left(\frac{-r+1}{t-r}\right) = \frac{r+1}{t-r}$$

$$\rightarrow f(n) = f\left(\frac{rn+1}{n-r}\right) + r = \frac{rn+r+0n-1}{n-r} = \frac{r^2n-1}{n-r}$$

$$\textcircled{2} \rightarrow f\left(n + \frac{1}{n}\right) = n^r + \frac{1}{n^r} \rightarrow f\left(n + \frac{1}{n}\right) = \left(n + \frac{1}{n}\right)\left(n^r + 1 + \frac{1}{n^r} + 1 - 1\right) = \left(n + \frac{1}{n}\right)\left(n^r + \frac{1}{n^r} + 1\right)$$

$$\rightarrow f(n) = x(n^r - 1) \quad x + \frac{1}{x} = t \xrightarrow{\textcircled{1}} x^r + \frac{1}{x^r} + \frac{r}{x} = t^r \rightarrow f(n) = x^r - \frac{r}{x}$$

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

$$x\sqrt{n} \in D_g \rightarrow g \circ f(m) \xrightarrow{\textcircled{1}} f(n) = x\sqrt{r} \rightarrow \textcircled{2} \rightarrow y = 0 \text{ نه}$$

$$x\sqrt{n} = r\sqrt{r} \rightarrow n = r$$

$$x\sqrt{n} = 1 \rightarrow n = 1$$

$$\rightarrow \textcircled{1} = r - 1 = \textcircled{1}$$

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$$f \circ f \left(\frac{\pi}{4} \right) = f \left(\cot \frac{\pi}{4} \times \frac{\pi}{4} \right) = f \left(\cot \frac{\pi}{4} \right) = f \left(\sqrt{1} \right) = \sqrt{1+1} = \sqrt{2}$$

۱

الف) $f \circ g \left(\frac{\pi}{4} \right) = f \left(\sqrt{1 + \cot^2 \frac{\pi}{4}} \right) = f \left(\sqrt{1 + 1} \right) = f \left(\sqrt{2} \right) = \sqrt{\frac{2-1}{2}} = \frac{\sqrt{1}}{2} = \frac{1}{2}$

ب) $f \circ g \left(\sqrt{2} \right) = f \left(\frac{\sqrt{2}}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}} \right) = f \left(-\sqrt{2} - 2 \right) = 1 + \sqrt{2} - 2 \rightarrow -\sqrt{2} - 2 - 2 = -4$

۲

$$g \circ f \left(\frac{\pi}{4} \right) = g \left(\sin \frac{\pi}{4} \right) = g \left(\frac{\sqrt{2}}{2} \right) = \frac{\sqrt{2}}{2} \sqrt{1 - \frac{1}{2}} = \frac{\sqrt{2}}{2} \cdot \frac{1}{\sqrt{2}} = \frac{1}{2}$$

۳

الف) $f \circ g(m) = \begin{matrix} \varepsilon \rightarrow \gamma \rightarrow \delta \\ \gamma \rightarrow \varepsilon \rightarrow \delta \\ \gamma \rightarrow \wedge \rightarrow \gamma \\ \wedge \rightarrow \gamma \rightarrow \gamma \end{matrix} = \{(\varepsilon, \delta), (\gamma, \delta), (\gamma, \wedge), (\wedge, \gamma)\}$

ب) $g \circ f(m) = \begin{matrix} \gamma \rightarrow \delta \rightarrow \wedge \\ \varepsilon \rightarrow \delta \rightarrow \wedge \\ \wedge \rightarrow \gamma \rightarrow \gamma \\ \gamma \rightarrow \wedge \rightarrow \gamma \end{matrix} = \{ \}$

ج) $f \circ f(m) = \{ \}$

د) $g \circ g(m) = \{(\gamma, \wedge), (\gamma, \gamma), (\gamma, \delta)\}$

۴

$f \circ g \quad (\varepsilon, \gamma) \in f \circ g \rightarrow a = \varepsilon$

$g \circ f \quad (\varepsilon, \gamma) \in g \circ f \rightarrow (b = \delta)$

$g = f(b, \gamma) = \varepsilon, b = \delta$

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

۵