

$$f \circ f\left(\frac{\pi}{3}\right) \leadsto f\left(\frac{\pi}{3}\right) = \cot \frac{\pi}{3} = \frac{\sqrt{3}}{1}$$

$$f\left(\frac{\pi}{3}\right) = \sqrt{3} \leadsto f(\sqrt{3}) = \sqrt{\sqrt{3}^2 + 1} = 2$$

$$f \circ f\left(\frac{\pi}{3}\right) = 2$$

$$f \circ g\left(\frac{\pi}{3}\right) \leadsto g\left(\frac{\pi}{3}\right) = 2 \times \frac{1}{3} = \frac{1}{3} \leadsto f\left(\frac{1}{3}\right) = \frac{\sqrt{1 + \frac{1}{9}}}{\frac{1}{3}} = \frac{\sqrt{\frac{10}{9}}}{\frac{1}{3}} = \sqrt{10}$$

$$f \circ g(\sqrt{2}) \leadsto g(\sqrt{2}) = \frac{\sqrt{2}}{1 - \sqrt{2}} \leq -2, \dots \leadsto f(-2, \dots) = [-2, \dots] = -4$$

$$g \circ f\left(\frac{\pi}{6}\right) \leadsto f\left(\frac{\pi}{6}\right) = \sin \frac{\pi}{6} = \frac{\sqrt{2}}{2}$$

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

$$f \circ g(n) = (f, d) \cup (r, d) \cup (y, 12) \cup (18, 12) \checkmark$$

$$g \circ f(n) = \emptyset \checkmark$$

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$$g \circ g(n) = (f, 18) \cup (r, 2) \cup (y, 10) \checkmark$$

$$(a, 3) \cup (r, 2) \leadsto (f, 2) \in f \circ g(n) \leadsto a = f$$

$$(f, d) \cup (b, 1) \leadsto (f, 1) \in g \circ f(n) \leadsto b = d$$

$$(a, b) = (f, d) \checkmark$$

$f \circ f: a(am+b) + b \Rightarrow a^2m + ab + b = cm + r$ $a^2 \neq c$ $a \neq \pm r$
 $g \circ f(-1) = ?$ $ab + b = r$ $b = r, 1$

$f(m) = cm + r$ $f(m) = -cm - r \Rightarrow f(-1) = -1$

$g(cm+r) = cm - r$
 $cm + r = -1 \Rightarrow m = -r$ $\left. \begin{array}{l} r(-r) - r = -1 \\ \boxed{g \circ f(-1) = -1} \end{array} \right\}$

$Df_n: \mathbb{R}$ $\sqrt{n+1} \quad n+1 \geq 0 \quad \mathbb{R}$
 $Dg_n: \mathbb{R} - \{0, 1\}$ $\frac{1}{n^2 - cm} \quad x(x-1) \neq 0 \quad x \neq 0, 1$

$Df_n \neq 0, 1 \Rightarrow Df_n: \mathbb{R}^+ - \{1\}$
 $\left. \begin{array}{l} \sqrt{n+1} \neq 0 \\ \sqrt{n+1} \neq 1 \end{array} \right\} x \neq 0, 1, x \neq 1$ $Df \circ g = \mathbb{R}^+ - \{1\}$
 $(0, \infty) - \{1\}$

$f(m) = \sqrt{1-m}$ $Df_n: x \leq 1$
 $g(x) = \sqrt{x}$ $Dg_n: x \geq 0$ $\} \cup [0, 1]$

$Df \circ g = [0, 1]$ $\Rightarrow \boxed{D(f \circ g) \circ f = [0, 1]}$
 $x \in [-1, 1] \Rightarrow 0 \leq f(m) \leq 1$

$f\left(\frac{cm+1}{m-r}\right) \Rightarrow \frac{cm+1}{m-r} = t \Rightarrow m = n-r$

$t \times m - r = cm + 1$
 $tm - rm = cm + 1$
 $x = \frac{rt+1}{t-r}$

$f(t) = cm + a$
 $f(t) = c\left(\frac{rt+1}{t-r}\right) + a = \frac{1rt - 11}{t-r} = \frac{1rt - 11}{t-r}$

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

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

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

$g \circ f = 0 \Rightarrow$

$f(m) = 1$

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

$g(1) = 0$

$f(x) = \sqrt{5}$

$x\sqrt{n} = \sqrt{5} \quad n = 5$

$g(\sqrt{5}) = 0$

$x_2 - x_1 = 4 - 1 = 1$