

$$Dg \circ f = ? \quad f(x) = \sqrt{\log \frac{x}{r} - 1} \quad g(x) = \sqrt{-x^2 + 2x - 1} \quad (1)$$

$x \in \mathbb{R}, f(x) \in Dg$

$$\log \frac{x}{r} \geq 0 \Rightarrow x \geq r \quad Dg \circ f = r$$

$$f \circ g(x) = r(x^2 - 2x + 1) - 1 = r x^2 - 2rx + r - 1 \quad (2)$$

$$g \circ f(x) = (rx - 1)^2 - r(rx - 1) + 1 = r^2 x^2 - 2rx + r - rx + r + 1 = r^2 x^2 - 3rx + 2r + 1$$

$$\Rightarrow r x^2 - 3x + 1 = r x^2 - 3x + 1 \Rightarrow r x^2 - 3x + 1 = 0 \Rightarrow x = \frac{3 \pm \sqrt{9 - 4r}}{2r}$$

$$\left. \begin{array}{l} g \circ f(x) = 2x^2 + 11 \\ f(x) = rx \end{array} \right\} \quad g(rx) = 2x^2 + 11 \Rightarrow g(t) = 2t^2 + 11 \quad \min t = 0$$

$$\min g(x-v) \Rightarrow g(x-v) = g(0) \Rightarrow x=v \quad \xrightarrow{f} \quad g(t) = 11$$

$$f(x) = rx - r \quad g(x) = t \Rightarrow r g(t) - r = r x^2 - 2x \Rightarrow \quad (3)$$

$$f \circ g(x) = r x^2 - 2x \quad g(t) = \frac{r x^2 - 2x + r}{r} = \frac{r}{2} - rx + \frac{r}{r}$$

$$g \circ f(x) \Rightarrow (rx - r) - r(rx - r) + \frac{r}{r} = rx^2 - 2x + 1 - rx + r + 1 + \frac{r}{r} = rx^2 - rx + 2 + 1 = rx^2 - rx + 3$$

$$rx^2 - rx = \frac{3}{r}$$

$$\left. \begin{array}{l} f \circ g = 2x - 2 \\ f \circ g = \frac{r}{2}x + r \end{array} \right\} \quad f g(x) = r f(x) - 1r$$

$$r g(x) - f(x) = -1r - f(x) \Rightarrow$$

$$r(x - 1) = 1r - f(x) \Rightarrow f(x) = r - rx$$

$$g(x) = -rx + r$$

$$f \circ g = r - r(-rx + r) = r - (-r^2 x + r^2) = r + r^2 x - r^2 = r^2 x - r(r - 1)$$

$$rx - r = \frac{r}{2}x + r \Rightarrow \frac{-r}{2} + r = \frac{r}{2}x + r \Rightarrow x = \frac{-r}{r} = -1$$

$$f(x) = 2^x \quad g(x) = \log_2 x \rightarrow x > 0$$

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$$f \circ g(x) < g \circ f(x) \quad x > x^r \Rightarrow x > x^r - 1$$

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

$\underbrace{x - \frac{r}{x}}_{+}$ $\underbrace{\frac{r}{x^r}}_{+}$

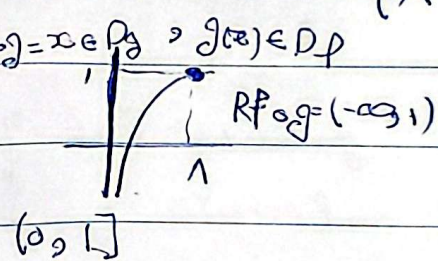
$$f(x) = ? \Rightarrow f(x) = x^r + x$$

$$f(x) = \log_2 x \rightarrow x > 0$$

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$$g(x) = \frac{1}{x} - x^r \quad D_{f \circ g} = x \in D_g \Rightarrow g(x) \in D_f$$

$$f \circ g = \log_2 \left(\frac{1}{x} - x^r \right)$$



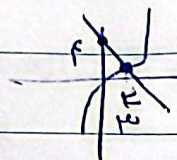
$$f \circ f(x) = 1 - x^r f(x)$$

$$g(x) = x - 1$$

$$h(x) = x^r + x^r - 1$$

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$$h(g(x)) = f(x)$$



$$(x-1)^r + x^r - 1 = 1 - x^r x^r \Rightarrow x^r - 1 + x^r - 1 = 1 - x^r x^r$$

$$\Rightarrow x^r + x^r - 1 = 0$$

$$x^r = 1 - x^r$$

$$f(x) = x - \frac{r}{x}$$

$$g \circ f(x) = 2x^r + 1$$

$$g(1) = 1 \quad x = ?$$

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$$f(x) = x - \frac{r}{x} = 1 \Rightarrow x = 1 \quad x = -1$$

$$g\left(x - \frac{r}{x}\right) = 2x^r + 1 \Rightarrow x = 1 \Rightarrow g(1) = 2 \cdot 1 + 1 = 3 \quad x = 0$$

$$x = -1 \Rightarrow g(-1) = -1 - 1 = -2 \quad x = -10$$

