Exercise 81

For the following exercises, use $f(x) = x^3 + 1$ and $g(x) = \sqrt[3]{x-1}$.

Find $(f \circ g)(2)$ and $(g \circ f)(2)$.

Solution

Write $(f \circ g)(x)$.

$$\begin{aligned}(f \circ g)(x) &= f(g(x)) \\ &= \left(\sqrt[3]{x-1}\right)^3 + 1 \\ &= (x-1) + 1 \\ &= x\end{aligned}$$

Write $(g \circ f)(x)$.

$$\begin{aligned}(g \circ f)(x) &= g(f(x)) \\ &= \sqrt[3]{(x^3+1)-1} \\ &= \sqrt[3]{x^3} \\ &= x\end{aligned}$$

Therefore,

$$(f \circ g)(2) = 2 \quad \text{and} \quad (g \circ f)(2) = 2.$$