Exercise 17

For the following exercises, use function composition to verify that $f(x)$ and $g(x)$ are inverse functions.

$$f(x) = \sqrt[3]{x-1} \text{ and } g(x) = x^3 + 1$$

Solution

To evaluate $f(g(x))$, plug the formula for $g(x)$ where x is in the formula for $f(x)$.

$$f(g(x)) = \sqrt[3]{(x^3 + 1) - 1}$$

$$= \sqrt[3]{x^3}$$

$$= x$$

To evaluate $g(f(x))$, plug the formula for $f(x)$ where x is in the formula for $g(x)$.

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

$$= (x - 1) + 1$$

$$= x$$

Therefore, $f(x)$ and $g(x)$ are inverse functions.