

Exercise 13

For the following exercises, use each pair of functions to find $f(g(x))$ and $g(f(x))$. Simplify your answers.

$$f(x) = \sqrt{x} + 2, \quad g(x) = x^2 + 3$$

Solution

Compute $f(g(x))$ by plugging the formula for $g(x)$ where x is in the formula for $f(x)$.

$$f(g(x)) = \sqrt{x^2 + 3} + 2$$

Compute $g(f(x))$ by plugging the formula for $f(x)$ where x is in the formula for $g(x)$.

$$\begin{aligned} g(f(x)) &= (\sqrt{x} + 2)^2 + 3 \\ &= (\sqrt{x})^2 + 2(2\sqrt{x}) + 2^2 + 3 \\ &= x + 4\sqrt{x} + 4 + 3 \\ &= x + 4\sqrt{x} + 7 \end{aligned}$$