## Exercise 19

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

$$f(x) = x^2 + 1, \ g(x) = \frac{1}{x}, \text{ and } h(x) = x + 3$$

---

**Solution**

Compute $f(g(h(x)))$ by plugging the formula for $h(x)$ where $x$ is in the formula for $g(x)$ and then plugging this result into the formula for $f(x)$.

$$g(h(x)) = \frac{1}{(x+3)}$$

$$= \frac{1}{x+3}$$

Therefore,

$$f(g(h(x))) = \left(\frac{1}{x+3}\right)^2 + 1$$

$$= \frac{1^2}{(x+3)^2} + 1$$

$$= \frac{1}{(x+3)^2} + 1.$$