

**Purpose:** In this problem set, we will define and explore compositions of functions.

1. Let  $f(x) = 2x + 1$ .

(a) Evaluate  $f(1)$ .

(b) Evaluate  $f(-3)$ .

(c) Evaluate  $f(\star)$ .

(d) Evaluate  $f(g(x))$ .

In the last part of the previous question,  $g(x)$  is some mystery function but we know it depends on  $x$ . When we send a function through another function, we call it “function composition” and the process comes with some shorthand notation. A more formal definition is below.

**Definition:** A **composition of functions** is when the output of a function is used as the input of another. We write  $f(g(x))$  or  $(f \circ g)(x)$  and we say “ $f$  of  $g$  of  $x$ ” or “ $f$  composed with  $g$  at  $x$ .”

2. For mystery functions  $f$  and  $g$ , express each of the following compositions of functions in words.

(a)  $(f \circ g)(x)$

(b)  $(g \circ f)(x)$

(c)  $(f \circ g \circ g)(x)$