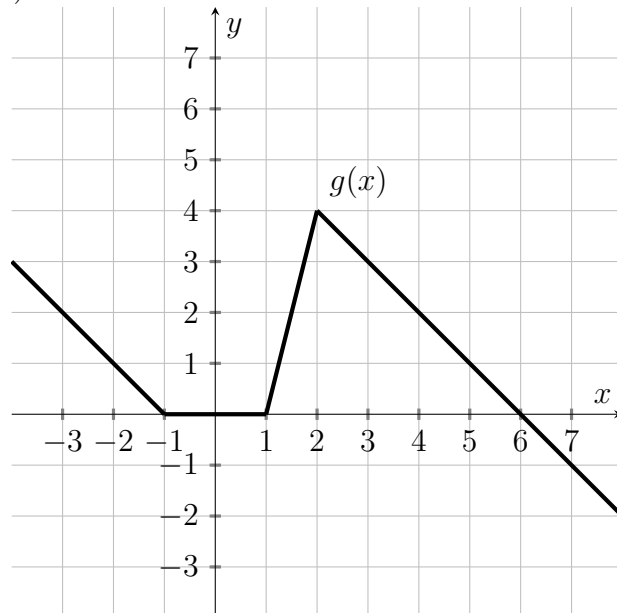
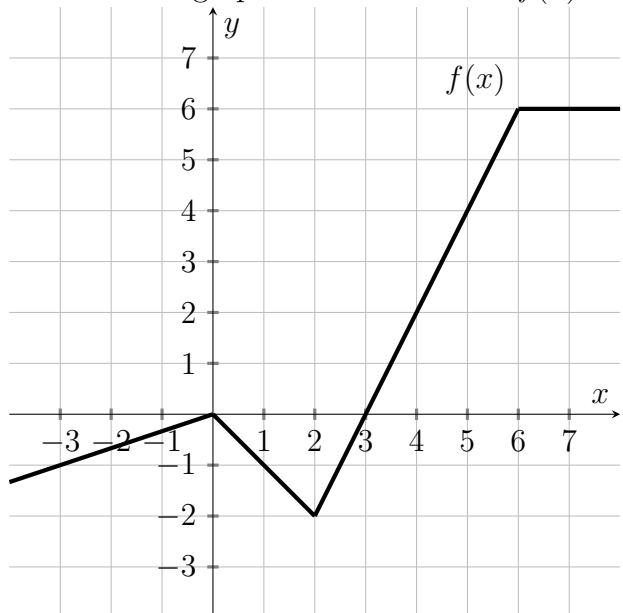


**Purpose:** In this problem set, you will explore computing function values of compositions of functions algebraically, numerically, and graphically.

1. Consider the graphs of the functions  $f(x)$  and  $g(x)$  below.



Find the corresponding function values:

(a)  $(f + g)(-3)$

(b)  $(f - g)(5)$

(c)  $(f \circ g)(4)$

(d)  $(g \circ g)(-3)$

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2. Let  $f(x) = \frac{x-1}{x+1}$  and  $g(x) = x^2 + 2$ . Find formulas for the following compositions. Simplify your results as much as possible.

(a)  $f \circ g$

(b)  $g \circ f$

3. Given  $f(x) = x^2$  and  $g(x)$  given in the table below, find the corresponding function values below. If a function value does not exist, justify why not.

$x$	$g(x)$
1	2
2	5
3	7
4	9
5	11

(a)  $(f \circ g)(1)$

(b)  $(g \circ f)(5)$

(c)  $(f \circ g \circ f)(2)$

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4. Is  $f \circ g$  always, sometimes, or never the same function as  $g \circ f$ ? Give some examples to justify your claim.

5. Recall the functions from question 2:  $f(x) = \frac{x-1}{x+1}$  and  $g(x) = x^2 + 2$ . Is  $x = -1$  in the domain of  $g \circ f$ ? Why or why not?

6. Suppose you have a friend who is hopelessly lost in Calculus I. As it turns out, they don't understand function composition at all! Luckily, you're pretty much an expert. Give a short explanation, draw a picture, and provide an example to help them out.