Investigation: Composition of Functions

We will divide the class into 2 teams. Team A and Team B.
Team A will be given a secret function A(x). Team B will be given a secret function B(x).

Step 1. Ms. Shih will pass a number to Team A first. Team A will find the values of A(x) and complete the table below.

For each number, once Team A has finished with their function, they will pass the answer they got to Team B. Team B will now use Team A's answer as their input and find the output. Team B will complete the table below.

Team A

x	B(x)

Team B

X	A(x)

Step 2: Team A will now try to figure out team B's function. Team B will now try to figure out team A's.

Step 3: Complete each statement.
The input of team A's is called x. The output of team A is called _____.

We used team A's output as team B's input. So Team B's input is called _____.

So, team B's output should be called _____.

Step 4: Now let's write the two separate function as a single composition of functions.

Complete the table using the composite function

X	B(A(x))

Step 5: Now let's try it the other way. Let's start with Team B first and then Team A and see what happens. Team B will complete the B table. Team A will complete the A table.

Team B

X	B(x)

Team A

x	**A(x)**

Step 6: Complete each statement.

The input of team B's is called x. The output of team B is called _____.

We used team B's output as team A's input. So Team A's input is called _____.

So, team A's output should be called _____.

Step 7: Now let's write the two separate function as a single composition of functions.

Complete the table using the composite function

X	B(A(x))

Step 8: Is composition of functions commutative (does order matter)?

2.8 (4.8) Composition of Functions

Lets practice those.
Given the functions $f(x) = 4x^2 - 2x + 1$ and $g(x) = -5x + 3$, find:

a. f(3)

b. f(-3)

c. g(-2)

d. g(4x - 1)

Today, we will be focusing on a special type of operation called composition. We already know how to do this.

Let $f(x) = 4x^2 + 5$ and g(x) = -3x + 7. Find the following.

a. f(g(2))

b. f(g(x))

c. Now redo part a using the answer you got from part b.

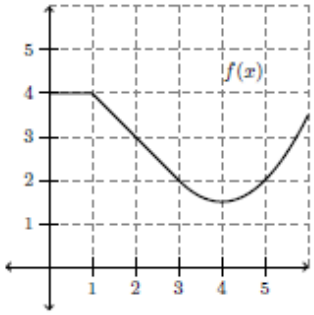
d. g(f(-2))

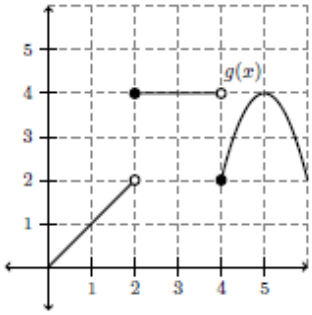
e. g(f(x))

e. Now redo part d using the answer you got from part e.

You Try!

1. Let f(x) and g(x) be functions defined with the graphs shown below. Use the graphs to evaluate the following.





a. f(g(1)) b. f(f(5)) c. g(f(5))

2. Given the functions f(x) = 3 + $\sqrt{x+5}$ and g(x) = 2 + (x – 1)^2. Find

a. f(4) b. f(g(4)) c. g(f(4))

3. The functions f and g are defined by these sets of input and output values.

g = {(1,2), (-2, 4), (5, 5), (6, -2)} **f = {(0, -2), (4, 1), (3, 5), (5, 0)}**

a. Find g(f(4)) b. Find f(g(-2)) c. Find f(g(f(3)))

4. The functions of f and g are defined by these sets of input and output values:

g = {(1, 2), (-2, 4), (5,5), (6, -2)} **f = {(2, 1), (4, -2), (5,5), (-2, 6)}**

a. Find g(f(2)) b. f(g(6))

c. Select any number from the domain of either g or f, and find f(g(x)) or g(f(x)). Describe what is happening.

5. Given f(x) = -x^2 + 2x + 3 and g(x) = (x – 2)^2, find

a. f(g(3)) b. f(g(2)) c. g(f(1))

d. f(g(x)) Simplify to remove all parentheses.

e. g(f(x)) Simplify to remove all parentheses.

f. Redo part b and c using the composite functions you got in part d and e.

Homework 2.8 Composition of Functions

Name: _____ Date: _____

Period: _____

1. The functions *f* and *g* are defined by sets of input and output values.

   $f = \{(5, 0), (-1, 1), (-3, 4), (1, 2), (3, 4), (-2, 6)\}$

   $g = \{(4, -1), (0, -2), (1, -1), (2, -2), (6, 0)\}$

   a. Find f(g(-3))

   b. Findg(f(-3))

   c. Find f(g(f(5))).

   d. Find g(f(g(0))).

2. Use these three functions to find each value: $f(x) = -3x + 5$, $g(x) = (x - 2)^2$, $h(x) = x^2 + 4$.

a. g(2x) + 1 b. h(f(7)) c. h(g(f(0))) d. f(h(x))

13. Solve.

a. $\sqrt{|x - 4|} = 3$

b. $(3 - \sqrt{x + 2})^2 = 4$

c. $|3 - \sqrt{x}| = 5$

d. $3 + 5\sqrt{1 + 2x^2} = 13$

16. Imagine translating the graph of $f(x) = x^2$ left 3 units and up 5 units, and call the image $g(x)$.

a. Give the equation for $g(x)$.

b. What is the vertex of the graph of $y = g(x)$?

c. Give the coordinates of the image point on the parabola that is 2 units to the right of the vertex.