Composition of Functions

The composition of functions is an operation that uses 2 functions to input one of them into the other function.

It is represented by $\circ$ and you will typically see a composition written as $(f \circ g)(x)$.

In regular functions, f(x) is the output of a function. The x in parentheses signifies the INPUT to the function. In this regard, since $(f \circ g)(x)$ is the same as f(g(x)), g(x) is serving the role that x does in parentheses for the output of functions (It is the x in f(x) meaning it is the INPUT to the function).

Let's practice a couple of examples and you will understand it!

What is $(f \circ g)(x)$ given the following functions?

$$f(x) = 2x^2 + 3x + 5$$

$$g(x) = \sqrt{x}$$

For composition, remember to plug in the function CLOSEST to x (g in this case) into the function FURTHEST from x (f in this case).

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

$$(f \circ g)(x) = 2x + 3\sqrt{x} + 5$$

That is all you need to do for composition of functions! Let's practice a couple more examples!

What is $(g \circ f)(x)$ given the following functions?

$$g(x) = -|x| + 5$$

$$f(x) = -2$$

Plug in f(x) into g(x) to follow the composition of $(g \circ f)(x)$.

$$(g \circ f)(x) = -|-2| + 5$$

$$(g \circ f)(x) = -2 + 5$$

$$(g \circ f)(x) = 3$$

What is $(a \circ b)(x)$ given the following functions?

$$a(x) = x^2 + 3x + 1$$

$$b(x) = x^2$$

Plug in b(x) into a(x) to follow the composition of $(a \circ b)(x)$.

$$(a \circ b)(x) = (x^2)^2 + 3x^2 + 1$$

$$(a \circ b)(x) = x^4 + 3x^2 + 1$$

Tips for Solving Problems:

1. Composition of functions involves plugging in the CLOSEST function to x in the composition into any place where there is x in the other function.

2. Make sure you know how to simplify other functions like square root functions, absolute value functions, quadratic functions etc. since these simplifications come in handy when doing composition of functions.

3. This is a very easy topic but make sure to practice questions in the quiz and review the questions in this lesson.