

Composite functions are functions inside functions. The main rule to follow is start with the most inside function and work your way outside.

We will use the following functions for our examples:

$$f(x) = 2x + 1 \quad g(x) = \frac{x}{3} \quad h(x) = \sqrt[3]{x}$$

Example 1- Find $f(g(9))$

The most inside function of $f(g(9))$ is $g(9)$, so let's find what $g(9)$ is.

$$g(9) = \frac{(9)}{3} = 3$$

Now we can substitute what we just found for $g(9)$ in the original composite function.

$$f(g(9)) = f(3) = 2(3) + 1 = 6 + 1 = 7$$

We found it!

$$\boxed{f(g(9)) = 7}$$

Example 2- Find $h(f(-14))$

The most inside function of $h(f(-14))$ is $f(-14)$, so let's find what $f(-14)$ is.

$$f(-14) = 2(-14) + 1 = -28 + 1 = -27$$

Now we can substitute what we just found for $f(-14)$ in the original composite function.

$$h(f(-14)) = h(-27) = \sqrt[3]{(-27)} = -3$$

We found it!

$$\boxed{h(f(-14)) = -3}$$

We will continue to use the following functions for our examples:

$$f(x) = 2x + 1 \quad g(x) = \frac{x}{3} \quad h(x) = \sqrt[3]{x}$$

Example 3- Find $g(g(108))$

The most inside function of $g(g(108))$ is $g(108)$, so let's find what $g(108)$ is.

$$g(108) = \frac{(108)}{3} = 36$$

Now we can substitute what we just found for $g(108)$ in the original composite function.

$$g(g(108)) = g(36) = \frac{(36)}{3} = 12$$

We found it!

$$g(g(108)) = 12$$

Example 4- Find $f(g(x))$

The most inside function of $f(g(x))$ is $g(x)$, so let's find what $g(x)$ is.

$$g(x) = \frac{x}{3} = \frac{x}{3}$$

There aren't any numbers to plug in for x , so just leave $g(x)$ in terms of x .

Now we can substitute what we just found for $g(x)$ in the original composite function.

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

We found it!

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

What happens when $x = 9$? Look how the answer compares to Example 1!