Composite functions

In a composite function, one function is used as a variable in the other function.

A composite of the two functions $f(x)$ and $g(x)$ can be written as $(f \circ g)(x)$ or as $f(g(x))$. It means to treat the function $g(x)$ as the variable in $f(x)$.

Let's look at a few examples.

Example

Find the composite function $(g \circ f)(x)$.

$$g(x) = \frac{2}{x^4}$$

$$f(x) = \sqrt[4]{x - 3}$$

To find the composite function $(g \circ f)(x)$, we plug $f(x)$ into $g(x)$, which means that we take the algebraic expression for $f(x)$ and substitute it for x in the algebraic expression for $g(x)$.

$$(g \circ f)(x) = g(f(x)) = \frac{2}{\left(\sqrt[4]{x - 3}\right)^4}$$

$$(g \circ f)(x) = g(f(x)) = \frac{2}{x - 3}$$

Here's another example.

Example

Find $h(g(x))$.

$$h(x) = 3x^2 - 2$$

$$g(x) = x - 4$$

To find the composite function $h(g(x))$, we plug $g(x)$ into $h(x)$, which means that we take the algebraic expression for $g(x)$ and substitute it for x in the algebraic expression for $h(x)$.

$$h(g(x)) = 3(x - 4)^2 - 2$$

$$h(g(x)) = 3(x - 4)(x - 4) - 2$$

$$h(g(x)) = 3(x^2 - 8x + 16) - 2$$

$$h(g(x)) = 3x^2 - 24x + 48 - 2$$

$$h(g(x)) = 3x^2 - 24x + 46$$