

# 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.

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## 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  $g(x)$ .

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

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



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Here's another example.

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### 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  $h(x)$ .

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

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

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

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

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

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