

Composition of Functions

↳ Composite functions

A composite function is the result of combining two (or more) functions.

Notation:

$$(g \circ f)(x) = g(f(x)) \longrightarrow \text{This means you are putting } f(x) \text{ into } g(x)$$

↳ of

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Example 1:

Given $f(x) = 2x + 3$ and $g(x) = x^2$ find:

$$\begin{aligned} \text{a) } (g \circ f)(x) &= g(f(x)) \\ &= (2x + 3)^2 \\ &= 4x^2 + 12x + 9 \end{aligned}$$

$$\begin{aligned} \text{b) } (f \circ g)(x) &= f(g(x)) \\ &= 2x^2 + 3 \end{aligned}$$

You can also evaluate a composition by substituting in a value of x .

Using the above functions, determine:

$$\begin{aligned} \text{a) } (g \circ f)(4) &= (g \circ f)(x) = 4x^2 + 12x + 9 \\ (g \circ f)(4) &= 4(4)^2 + 12(4) + 9 \\ &= 121 \end{aligned}$$

$$\begin{aligned} \text{b) } (f \circ g)(4) &= (f \circ g)(x) = 2x^2 + 3 \\ (f \circ g)(4) &= 2(4)^2 + 3 \\ &= 35 \end{aligned}$$

$$\underline{\text{OR:}} \text{ ① } g(4) = (4)^2 = 16$$

$$\text{② } f(16) = 2(16) + 3 = 35$$

Example 2:

Given: $f(x) = \sqrt{x}$ and $g(x) = x^2$ find:

$$\begin{aligned} \text{a) } (g \circ f)(x) &= (\sqrt{x})^2 \\ &= x \end{aligned}$$

$$\begin{aligned} \text{b) } (f \circ g)(x) &= \sqrt{x^2} \\ &= x \end{aligned}$$

Notice:

$$(f \circ f^{-1})(x) = x$$

$$(f^{-1} \circ f)(x) = x$$