

The Composition of Functions



Preliminaries and Objectives

Preliminaries

- Functions
- Function Notation

Objectives

- Define the composition of functions

Functions and Notation

$$f(x) = x^2$$

$$f(t) = t^2$$

$$f(-3) = 9$$

$$f(g(x)) = [g(x)]^2$$

Composition of Functions

$$f(x) = x^2$$

$$g(x) = x - 3$$

$$f(\bullet) = \bullet^2$$

$$f(g(x)) = (x - 3)^2$$

Composition of Functions

$$f(x) = x^2$$

$$g(\bullet) = \bullet - 3$$

$$f(g(x)) = (x - 3)^2$$

$$g(f(x)) = x^2 - 3$$

Example 2

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

$$g(x) = 3x$$

Find $f(g(x))$ and $g(f(x))$

$$f(g(x)) = \sqrt{3x}$$

$$g(f(x)) = 3\sqrt{x}$$

Example 3

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

$$g(x) = x - 6$$

$$h(x) = 3x$$

Find $f(g(h(x)))$

$$h(x) = 3x$$

$$g(h(x)) = g(3x) = 3x - 6$$

$$\begin{aligned} f(g(h(x))) &= f(3x - 6) \\ &= \sqrt{3x - 6} \end{aligned}$$

Recap

To find $f(g(x))$, use the output of $g(x)$ as the input to $f(x)$.