Composition of Functions
Lecture 3
Section 1.1

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Objectives

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- Understand piecewise functions.
- Understand composition of functions.

Piecewise Functions

Definition (Piecewise Functions)

A **piecewise function** is a function that is defined in parts, with different formulas used for different parts of its domain.

Piecewise Functions

Example

- Let
$$f(x) = \begin{cases} 2x + 1 & \text{if } x < 3 \\ x + 5 & \text{if } x \geq 3 \end{cases}$$

- Find the values of $f(2)$, $f(3)$, and $f(4)$.

- Draw the graph of $f(x)$.

Example 1.1.4

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The Deckers Outdoor Corporation produces the popular Ugg boots. While Uggs have been on the market since 1979, during 2003 Ugg sales, and consequently stock values, increased dramatically. Let
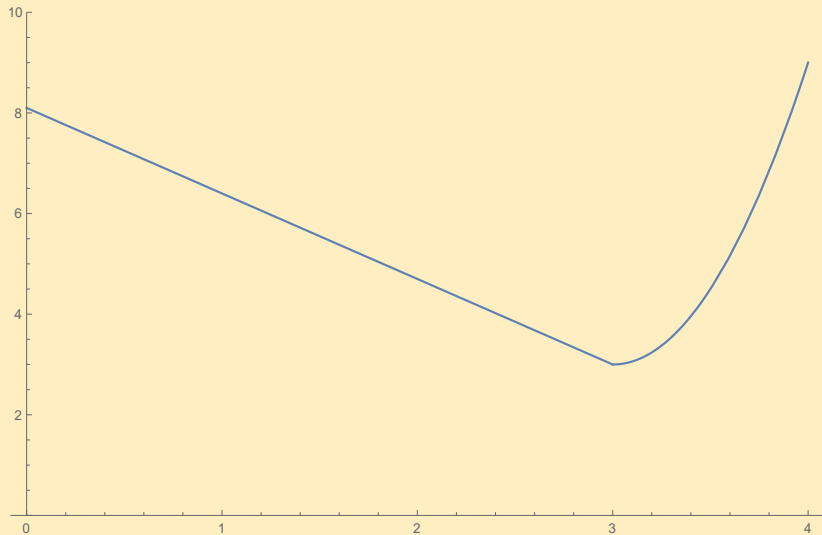
$$S(t) = \begin{cases} 8.1 - 1.7t & \text{if } t < 3 \\ 6t^2 - 36t + 57 & \text{if } t \geq 3 \end{cases}$$

where t represents the number of years after January 1, 2000.

(a) Find and interpret the values of $S(2)$, $S(3)$, and $S(7.5)$

Example 1.1.4

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Composition of Functions

Examples

- Let $f(x) = 3x + 2$ and $g(x) = x^2 + 1$.
- Find $f(g(x))$ and $g(f(x))$.

Composition of Functions

Examples

- Let

$$f(x) = x^2,$$
$$g(x) = 4 - x,$$
$$h(x) = \sqrt{x},$$
$$k(x) = \frac{1}{x}.$$

- Find $k(h(g(f(x))))$.
- What can be said about the domain and range of each function?

Composition of Functions

Example

The owner of a small furniture company finds that if r recliners are produced per hour, the cost will be $C(r)$ dollars, where

$$C(r) = r^3 - 50r + \frac{1}{r+1}.$$

Suppose also that the production level satisfies

$$r = 4 + 0.3w,$$

where w is the hourly wage of the workers.

Composition of Functions

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(a) Find an expression for cost as a function of hourly wage.

(b) What will be the cost of production if the workers are paid $20 per hour?