The Chain Rule (Differential Form)

Lecture 18
Section 2.4

Robb T. Koether

Hampden-Sydney College

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Objectives

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- The Chain Rule.

The Chain Rule (Differential Notation)

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Let $y = f(u)$ and $u = g(x)$ be functions. The derivative of their composition is

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}.$$

Examples

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Use the Chain rule to find the derivatives of these functions.

- Let $y = u^3$ and $u = x^2 + 1$.

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- Let $y = u^3$ and $u = x^2 + 1$.
- Let $y = \sqrt{u}$ and $u = x^2 + 1$.

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- Let $y = u^3$ and $u = x^2 + 1$.
- Let $y = \sqrt{u}$ and $u = x^2 + 1$.
- Let $y = \sqrt{u}$, $u = v^2 + 1$, and $v = x^4 + x$.

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- Let $y = u^3$ and $u = x^2 + 1$.
- Let $y = \sqrt{u}$ and $u = x^2 + 1$.
- Let $y = \sqrt{u}$, $u = v^2 + 1$, and $v = x^4 + x$.
- Let $y = \dfrac{1}{u}$, $u = \sqrt{v}$, and $v = 4 - x^2$.

Example 2.4.10

Example 2.4.1

Jarvis manages an appliance manufacturing firm. He determines that when blenders are price at p dollars apiece, the number sold each month will be

$$D(p) = \frac{8,000}{p}.$$

Furthermore, he estimates that t months from now, blenders will be selling at a price of $p(t) = 0.06t^{3/2} + 22.5$ dollars apiece.

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(a) At what rate should Jarvis expect the monthly demand $D(p)$ to be changing with respect to time 25 months from now?

(b) Will the demand be increasing or decreasing that time?