MA104 Lesson 11

Chain Rule

Friday, 01 February, 2008

Outline

- Admin
- Last Class
- Chain Rule
  - Course Guide
  - Chain Rule
    - Definitions
    - Example Problems
    - Do Problem Help
    - Board Work
- Look Forward - Problem Solving Lab
  - Course Guide

Admin

1. Block I Homework due Today in class.
2. Don't forget proper documentation!
3. Course Guide Purchase (B-Theis, D-Scalia and Wynne)

WPR

1. WPR 5 questions - 1st question is 6 by hand derivatives.
2. Don't simplify the derivatives to ensure if you get it right you don't miss the answer by simplifying wrong.
3. For Monday; get in groups and bring a question you think might be on the board to solve as a review.
4. I will post or give you a copy of the Block I homework on Friday for study purposes.
5. No Crib Sheet - I still suggest making a study sheet to look over.

Derivatives of Trig Functions and the Chain Rule

Questions?

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Objectives

1. Calculate derivatives of composite functions using the chain rule.

READ

1. Section 3.4, pages 197-203 (Stop before How to Prove the Chain Rule, pg 202).
2. Student Notes.

THINK ABOUT

1. Can you interpret the chain rule in terms of the pulley system below? If we rotate (change) A slightly, how does C rotate (change), or in other words, what is the rate of change of C with respect to A?

DO Problems

1. Section 3.4/ 1, 5, 7, 9, 11, 13, 25, 53
2. Section 3.6/ 3, 4, 9, 23

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Definitions

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$$F'(x) = f'(g(x)) \cdot g'(x)$$

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

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3. In words (Text pg. 199) - Derivative of the outer function, evaluated at inner function times the derivative of the inner function

Power Rule combined with Chain Rule

If n is any real number and $u = g(x)$ is differentiable, then

$$\frac{d}{dx}(u^n) = nu^{n-1}\frac{du}{dx}$$

Or

$$\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1} \cdot g'(x)$$

Example Problems

$$\frac{d}{dx}\underbrace{f}_{\substack{\text{outer}\\\text{function}}}\underbrace{(g(x))}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}} = \underbrace{f'}_{\substack{\text{derivative}\\\text{of outer}\\\text{function}}}\underbrace{(g(x))}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}} \cdot \underbrace{g'(x)}_{\substack{\text{derivative}\\\text{of inner}\\\text{function}}}$$

Example Problems

$$y = sin(x^2)$$

Example Problems

$$\frac{d}{dx} \underbrace{\sin}_{\text{outer function}}$$

Example Problems

$$\frac{d}{dx} \underbrace{\sin}_{\substack{\text{outer}\\ \text{function}}} \underbrace{(x^2)}_{\substack{\text{evaluated}\\ \text{at inner}\\ \text{function}}} =$$

Example Problems

$$\frac{d}{dx}\underbrace{\sin}_{\substack{\text{outer}\\\text{function}}}\underbrace{(x^2)}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}} = \underbrace{\cos}_{\substack{\text{derivative}\\\text{of outer}\\\text{function}}}$$

Example Problems

$$\frac{d}{dx}\underbrace{\sin}_{\substack{\text{outer}\\\text{function}}}\underbrace{(x^2)}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}} = \underbrace{\cos}_{\substack{\text{derivative}\\\text{of outer}\\\text{function}}}\underbrace{(x^2)}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}}.$$

Example Problems

$$\frac{d}{dx}\underbrace{\sin}_{\substack{\text{outer}\\\text{function}}}\underbrace{(x^2)}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}} = \underbrace{\cos}_{\substack{\text{derivative}\\\text{of outer}\\\text{function}}}\underbrace{(x^2)}_{\substack{\text{evaluated}\\\text{at inner}\\\text{function}}} \cdot \underbrace{2x}_{\substack{\text{derivative}\\\text{of inner}\\\text{function}}}$$

Do Problem Help

1. Section 3.4/ 1, 5, 7, 9, 11, 13, 25, 53
2. Section 3.6/ 3, 4, 9, 23

Board Work

1. $y = \cos \omega x$

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Lesson 11 - Problem Solving Lab

1. OBJECTIVES:
   1.1 1. Calculate derivatives of composite functions using the chain rule.
2. READ:
   2.1 Stewart: Section 3.4, pages 197-203 (Stop before How to Prove the Chain Rule, pg 202).
3. THINK ABOUT:
   3.1 Can you interpret the chain rule in terms of the pulley system below? If we rotate (change) A slightly, how does C rotate (change), or in other words, what is the rate of change of C with respect to A?
4. DO:
   4.1 Section 3.4/ 1, 5, 7, 9, 11, 13, 25, 53
   4.2 Section 3.6/ 3, 4, 9, 23

Questions?

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