MA104 Lesson 6

Derivatives and Rates of Change

Wednesday, 23 January, 2008

Outline

Admin

Last Class

Derivatives and Rates of Change
- Course Guide
- Derivatives and Rates of Change
  - Definitions
- An Example Problem
- Continuity and the derivative

Look Forward - Derivative as a Function
- Course Guide

Admin

1. DO PROBLEM INFO: In the right corner of page: Name, Section, Lesson #

Admin

2. **I will not cover the Intermediate Value Theorem, but I will quiz you on it. Learning this concept is up to you as part of the course directors guidance.**

Admin

3. **Solution Manual is in TH226. If you are stuck on homework or do problems go to TH226 and look at the solution manual.**

Continuity

2.5.42
Questions?

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Objectives

1. Find the slope of a line tangent to a curve at a point using the limiting value of the slopes of the secant lines.
2. Understand the relationship between average rate of change and instantaneous rate of change graphically, numerically, and algebraically.
3. Know and understand the definition of the derivative at a number.

READ

1. Stewart: Section 2.7, pages 143-150.
2. Student Notes.

THINK ABOUT

1. Given the graph of a function, how would you approximate the instantaneous rate of change of the function at a point?

DO Problems

1. Section 2.7/ 3, 13, 16, 22, 41

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Definitions

1. Definition #1

$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

if the limit exists

Definitions

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$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

   if the limit exists

2. Definition #2

$$m = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

Definitions

1. Definition #1

$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

   if the limit exists

2. Definition #2

$$m = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

3. Definition #3 - velocity at point a

$$v(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

Definitions

1. Definition #4

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

Definitions

1. Definition #4

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

2. Definition #5

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

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An Example Problem

1. Mathematica for example 1 page 144 $\quad y(x) = x^2$
2. Algebraically $y = x^2$

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Continuity and the derivative

1. How does it tie together?

Continuity and the derivative

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2. Continuity says that

$$\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x)$$

Continuity and the derivative

1. How does it tie together?
2. Continuity says that

$$\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x)$$

3. Smoothness says that

$$\lim_{x \to a^-} \frac{f(x) - f(a)}{x - a} = \lim_{x \to a^+} \frac{f(x) - f(a)}{x - a}$$

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Lesson 7 - Derivative as a Function

1. OBJECTIVES:
   1.1 Know and understand the definition of the derivative and apply the definition to find derivatives of basic polynomial functions.
   1.2 Understand when a function fails to be differentiable.
   1.3 Understand the graphical, algebraic and physical interpretations of the derivative.
2. READ:
   2.1 Stewart: Section 2.8, pages 154-161.
   2.2 Student Notes.
3. THINK ABOUT:
   3.1 Why do we have different notations for representing the derivative?
4. DO:
   4.1 Section 2.8/ 17, 20, 21, 35, 38

Questions?

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