MA104 Lesson 15

Max and Min

Friday, 8 February, 2008

Outline

- Admin
- Last Class
- Max and Min
  - Course Guide
  - Max and Min
    - Max and Min
  - An Example
    - The Dreaded Thayer Board Work
- Look Forward - Derivatives and the Shapes of Curves
  - Course Guide

Admin

1. Project I
2. Fish Fry Tonight - Holy Innocents Episcopal Church - 1700-2000.

WPR AAR

Questions?

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Objectives

1. Know the definitions of local (or relative) and absolute (or global) extreme values of a single variable function.
2. Understand the definition of a critical number and be able to find the critical numbers of a single variable function.
3. **Understand Fermat's Theorem and be able to say why its converse might be false.**
4. Understand the Extreme Value Theorem and its applications.
5. Be able to apply the Closed Interval Method for a continuous function on a closed interval in order to find the absolute maximum and minimum:
   - 5.1 Determine the function value at the critical numbers.
   - 5.2 Determine functional values at endpoints of the interval.
   - 5.3 Classify the largest values from a and b above as the absolute maximum, and the smallest from a and b as the absolute minimum.

READ

1. Stewart: Section 4.1, pages 271-276.
2. Student Notes.

THINK ABOUT

1. In Figure 6 on page 272, why isn't 3 the absolute maximum? Why does the text say there isn't one at all?

DO Problems

1. Section 4.1/ 3, 6, 31, 43, 51, 60

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Definitions

1. Definition 1 - pg 271
2. Definition 2 - pg 271
3. Definition 3 - pg 272
4. Definition 4 - pg 273 - On your Own
5. Definition 6 - pg 274
6. Definition 7 - pg 274

The Closed Interval Method

1. Easiest way to find max and mins

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Don't get a ticket

Major Bowman is heading up the hill by Michie Stadium in his 1965 Mustang. He wants to see how fast he can go up the hill. As he got to a good speed he remembered that the MPs sit at lot D to catch speeders. He then slowed down as fast as possible. His speed is given by the following equation:

$$f(t) = 45e^{-(\frac{t-25}{10})^2} + 5$$

At what time was he going the fastest and how fast was he going at that time?

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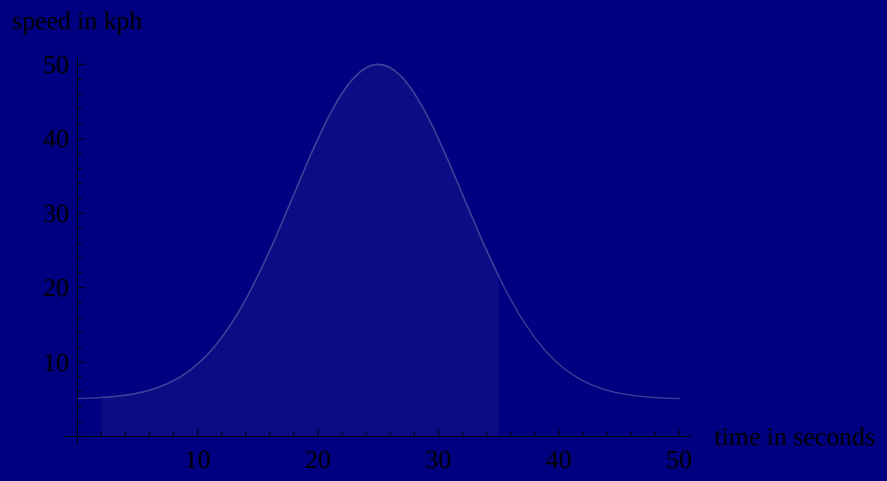

Board Work find critical numbers and or Global Max and Min

1. $s(t) = 3t^4 + 4t^3 - 6t^2$
2. $h(p) = \dfrac{p-1}{p^2+4}$
3. $f(x) = xe^{-x^2/8} \quad [-1, 4]$
4. Use a graph to estimate the absolute max and min then use calculus to find the exact max and min of
   $f(x) = x - 2\cos x \quad -2 \leq x \leq 0$

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Lesson 16 - Derivatives and the Shapes of Curves

1. OBJECTIVES:
   - 1.1 Be able to classify critical points as local maxima or minima using:
     - 1.1.1 The First Derivative Test (Examining increasing/decreasing nature of function).
     - 1.1.2 The Second Derivative Test (Examining function concavity).
     - 1.1.3 A plot of the function.
   - 1.2 Given the graph of a function, sketch its first and second derivative functions.
   - 1.3 Given the graph of the derivative of a function, sketch a possible original function.
2. READ:
   - 2.1 Stewart: Section 4.3, pages 287-294.
3. THINK ABOUT:
   - 3.1 What does a function's derivative tell us about the function?
   - 3.2 What does a function's second derivative tell us about the function?
4. DO:
   - 4.1 Section 4.3/ 2, 8, 19, 22, 32

Questions?

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