Section 4.6 : Applied Optimization

Chapter 4 : Applications of Derivatives

Math 1551, Differential Calculus

"There is geometry in the humming of the strings, there is music in the spacing of the spheres." - Pythagoras

Section 4.6 Applied Optimization

Topics

1. Applied Optimization Problems

Learning Objectives

For the topics in this section, students are expected to be able to:

1. Solve optimization problems.

Steps to Solving Max/Min Problems

1. Draw a picture, if possible.
2. Determine all the variables and equations.
3. Write the function you wish to optimize in terms of just one variable.
4. Take the derivative.
5. Find all critical numbers.
6. Use the first derivative test to find all local extrema.
7. Answer the original question, with units.

Example

A container with a square base, vertical sides, and an open top is to be made from 192 square feet of material. Determine the dimensions of the container that has the maximum volume.

In-Class Participation Activity: Worksheet

The remainder of the examples are incorporated into a worksheet.

- Please solve worksheet problems in groups of **2 to 3 students**
- Each group submits **one** completed worksheet
- Clearly print full names at the top of your sheet
- Every student in a group gets the same grade
- Grading scheme per question:
  - 0 marks for no work, working alone or in a group of 4 or more
  - 1 mark for starting the problem or for a final answer with insufficient justification
  - 2 marks for a complete solution

Examples

Solve the following problems in groups of 2 or 3 students.

a) A cylindrical can is to be constructed to hold 32π cubic meters of liquid. Suppose that the material for the top and bottom of the can costs twice as much as the cost for the material on the side of the can. What are the dimensions of the can that costs the least to manufacture?

b) A poster is to contain 50 square inches of printed material, with margins of 4 inches on the top and bottom and 2 inches on each side. Compute the overall dimensions of the poster if the total area is a minimum.