MATH 135 Lecture Notes
October 12, 2006

Section 4.7
Applied Maximum and Minimum Problems

Study the chart on page 144 Steps in Solving Applied Maximum and Minimum Problems.

Step 1. **Understand** the problem by reading carefully. Identify the quantity Q to be maximized or minimized.

Step 2. If possible, draw a figure so you can **visualize** the problem.

Step 3. Assign another variable, upon which Q depends. Write an **equation** for Q in terms of this variable.

Step 4. Take the **derivative** of the function in Step 3.

Step 5. Set the derivative equal to zero and **solve** the resulting equation.

Step 6. **Check** as to whether the value found in Step 5 makes Q a maximum or a minimum. This might be clear from the statement of the problem, or it might require one of the derivative tests.

Step 7. Be sure the stated **answer** is the one required. Some problems require the maximum or minimum value, and others require values of other variables that give the maximum or minimum value.

To motivate maximum and minimum problems, we will look at exercise 24 on page 143. The amount of fence needed is the quantity Q. The exercise requires us to write Q as a function of x. To sketch the graph we find the critical value of x, where the derivative is zero. For that value, the graph is concave up, so the corresponding value of Q is the minimum amount of fence needed for an area of 20,000 ft^2.

Study Examples 1-4 on pages 144-146 and Example 7 on page 147 to see how these steps are applied in solving problems requiring the maximum or minimum of a quantity.

Homework (with hints) pages 148-149

1- you may already know how to do this from intermediate algebra. Solve this time using the derivative.
5- use the second derivative test to show that you have a maximum.
9-You'll need to use the Pythagorean theorem as in Example 4.
11-This is similar to the problem we do in class.
13- After t hours ship B will be $40 - 16t$ miles north of ship A's starting point. How far east of that point will ship A be?
15- Let x represent one leg. Find the other leg in terms of x.
19- What do you have to do first in order to find slope?
23- volume of box = area of base times height x. First express the side of the base in terms of x.
25-Find the radius of the semicircles in terms of x.