Section 5.6: Optimization and Modeling
Steps for Math Modeling

- Identify the unknowns. Pick a symbol for each.

- Find the quantity you want to minimize or maximize. Express it as a function of the other variables.

- Use other information in problem to relate the other variables.

- Rewrite the function you want to minimize or maximize as a function of one variable.

- Determine the bounds on the variable. What's the smallest it could be? the largest?

- Using the second derivative to find where the function is concave up or concave down and the inflections points.

- The min or max can only occur at critical points or endpoints (if they exist). Use those to find the min or max. Then check that it really is a min or max.

Example Problems (from book):

1. A farmer has 500 yards of fencing with which to fence in three sides of a rectangular pasture. A straight river will form the fourth side. Find the dimensions of the pasture of greatest area that the farmer can fence.

2. A theater owner charges $5 per ticket and sells 250 tickets. By checking other theaters, the owner decided that for every one dollar she raises the ticket price, she will lose 10 customers. What should she charge to maximize revenue?

3. A manufacturer must produce a sturdy rectangular container with a square base and a volume of 128 cubic feet. The cost of materials making up the top and four sides is $2 per square foot, while the cost of the materials making up the bottom (which must be reinforced) is $6 per square foot. Find the dimensions of the box that minimizes the cost of materials.

4. From a 9-inch by 9-inch piece of cardboard, square corners are cut out so that the sides can be folded up to form a box with no top. What should x be to maximize the volume?