Maximum/minimum problems worksheet #5
Mixed practice

1. An open rectangular box is to be made from a 11 by 13 inch piece of cardboard by cutting squares of length \( x \) from the corners and folding up the sides.

   a) What should \( x \) be to maximize the volume of the box?

   b) What is the volume of the box of maximum volume?

2. A store determines that its profit equation (in thousands of dollars) is given by
   \[ P = -x^3 + 23.5x^2 + 260x - 200 \]
   where \( x \) is the number of TVs sold per month.

   a) How many TVs should be sold monthly for the store to make the maximum profit?

   b) What is that maximum profit?
3. A rectangular field, bounded by one side by a stream, is to be fenced in on the other three sides. 240 feet of fence is available to be used.

a) What are the dimensions of the largest field that can be fenced in?

b) What is the area of that field of maximum area?

4. A rectangular plot of land is to be enclosed by a fence and divided into parts by another fence parallel to one pair of sides. There is 660 m of fencing available to build this fence.

a) What are the dimensions of the maximum area of the plot of land that can be enclosed in this manner?

b) What is the area of this plot of land?
5. A rectangular plot of land is divided by a fence across its width. The area of the rectangular plot is 216 square meters.

a) What dimensions of the rectangle will minimize the amount of fence used?

b) What is the amount of fence needed?

6. A fence must be built to enclose a rectangular area of 525 square feet. Fencing material costs $3.50 per foot for the two sides facing north and south, and $1.50 per foot for the other two sides.

a) Find the dimensions of the rectangle that minimizes the cost of the fence.

b) Find the cost of the least expensive fence.
7. An open-topped box with a square base and rectangular sides is to have a volume of 256 cubic inches.

   a) Find the dimensions that require the minimum amount of material (surface area).

   b) What is the surface area of this box?

8. An open-topped rectangular box with a square base is to be made from 432 square inches of material.

   a) Find the dimensions of the box with maximum volume.

   b) What is this volume?
9. A closed-topped rectangular box with a square base is to have a volume of 200 cubic feet. The material for the top and bottom costs $2.50 per square foot and the material for the sides costs $3.50 per square foot.

   a) Find the dimensions that will minimize the cost of the materials.

   b) What is the cost of this box?