Rutgers University
Math 151

Section 4.6: Optimization - Worksheet

1. Farmer Brown wants to enclose rectangular pens for the animals on her farm. The three parts of this problem are independent.
   (a) Suppose that Farmer Brown wants to enclose a single pen alongside a river with 300 ft of fencing. The side of the pen alongside the river needs no fencing. What dimensions (length and width) would produce the pen with largest surface area?
   (b) Suppose that Farmer Brown has 360 ft of fencing to enclose 2 adjacent pens. Both pens have the same height, but the second one is twice as wide as the first. What is the largest total area that can be enclosed?
   (c) Suppose that Farmer Brown wants to enclose a total of 2,400 ft^2 in two adjacent pens having the same dimensions. What is the minimal amount of fencing needed?

2. A rectangular box has total surface area 216 in^2, and the length of its base is 4 times its width. Find the dimensions of such a box with largest volume.

3. A rectangular box is created by cutting equal size squares from the corners of a 10 in by 20 in cardboard rectangle and folding the sides. What size should the cut squares be for the resulting box to have the largest possible volume?

4. A rectangle has base on the x-axis and its two other vertices on the graph of $y = \frac{1}{25+x^2}$. Find the dimensions of such a rectangle with largest possible area.

5. A circular cone is created by cutting a circular sector from a disk of radius 9in and sealing the resulting open wedge together. What is the largest possible volume of such a cone?

6. The parts of this problem are independent.
   (a) Find the point on the line $2x + y = 5$ that is closest to the origin.
   (b) Find the point on the graph of $y = \sqrt{x}$ that is closest to the point $(3, 0)$.