Part I (due at the beginning of class Tuesday, November 25)

See what you can do with problems 48, 49, and 50 on the Derivatives handout.

Part II: Problems (due at the beginning of class Tuesday, November 25)

A couple optimization problems for more review/practice. The first has actual numbers; the second has a constant A involved.

Remember that when we're optimizing on a closed interval, the Extreme Value Theorem allows us to just check the value of the function we're trying to optimize at the endpoints and the critical points. When we're optimizing on an open interval, the Extreme Value Theorem doesn't apply, so we have to use either the First Derivative Test or the Second Derivative Test to determine if we have a maximum or a minimum (or neither) at any critical points.

For the First Derivative Test, we use the first derivative to determine the increasing/decreasing behavior of our original function to the left and right of the critical point to decide if the original function has an max or min at the critical point. For the Second Derivative Test, we take the second derivative of our function, plug in our critical point, and look at the value of the second derivative there to determine if our original function is concave up or concave down at the critical point, which tells us whether we have a max or a min (or neither) at the critical point.

1. Suppose Sam decides to build a rectangular garden using 100 feet of fence. One side of the garden will be against an existing wall. Sam wants to grow *all* the vegetables and thus is hoping to maximize the area of the garden. Find the dimensions of the garden with maximum area in this situation.
   (a) Draw a picture of the garden with the wall acting as one side.
   (b) Let x be the length of one side of the garden. Label your picture with x and the other side length(s).
   (c) What is the largest value x can be? What is the smallest? Is the interval open or closed?
   (d) Write a function for the area of the garden.
   (e) Find the maximum value of the area function on the interval you gave in (c).
2. Suppose a rectangle has area A. What dimensions of the rectangle give the smallest perimeter?
   (a) Draw a picture of the rectangle.
   (b) Let x be the length of one side of the rectangle. Label your picture with x and the other side length(s).
   (c) What is the largest value x can be? What is the smallest? Is the interval open or closed?
   (d) Write a function for the perimeter of the rectangle.
   (e) Find the minimum value of the perimeter function on the interval you gave in (c).