MA 15910, Lesson 30 Notes
Applications of Absolute Extrema, Section 6.2

This lesson will cover examples of applications of calculus to find a maximum or minimum. Here are the steps to use.

1. Read the problem carefully. Write what is given or known and what is not known.
2. If possible, sketch a diagram and label it.
3. Decide which variable is to be maximized or minimized. Express that variable as a function of one other variable (the primary equation). (You may have to use a secondary equation and make a substitution in order to get an equation in only one variable.)
4. Find the domain of the function.
5. Find the critical values for the function from step 3.
6. If the domain is a closed interval, evaluate the function at the endpoints and at each critical value within that interval to see which value yields the absolute maximum or absolute minimum. If the domain is an open interval, you may have to use a sign chart to determine any relative extrema and determine the limits as the endpoints of the interval are approached to see if an absolute maximum or minimum exists at one of the critical values.

Be sure to read the CAUTION note on page 313 on the section 6.2 from the 2nd half of your textbook. Do not skip step 6; do not automatically assume that any critical value found is the maximum or minimum value; a maximum or minimum may occur at an endpoint.

Example 1: Find two positive integers that have a sum of 110 and their **product is a maximum**.

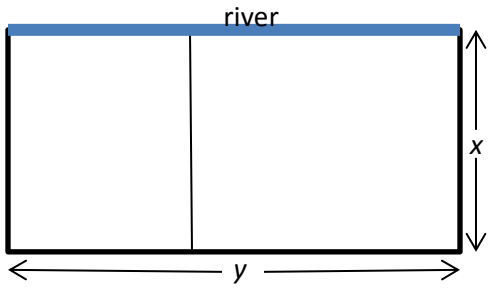
The equation to be maximized is the product equation. The sum information will be used to write a secondary equation which will be used for a substitution in the primary product equation.

Example 2: Find two positive integers that have a product of 192 and the **sum of the first plus three times the second is a minimum**.
The equation to be minimized is from the bold print words above. The product information will be used to write a secondary equation, which is substituted in the primary equation.

Example 3: What positive number x **minimizes the sum of x and its reciprocal**?
The primary equation to be minimized is the equation from the sum information.

Example 4: The difference of two numbers is 50. Find the two numbers such **that their product is a minimum**.
The primary equation to be minimized is a product equation. The difference information gives a secondary equation that be substituted into the primary equation.

Example 5: A farmer wants to enclose two rectangular areas adjacent to a straight river, one for sheep and one for horses (see picture below). There are 480 yards of fencing available. What is the **largest total area** that can be enclosed? What are the dimensions of *x* and *y*.
The primary equation to be maximized is about the area. The fencing information can be used to write a secondary equation, and this equation can be substituted into the primary equation.



Example 6: A carpenter is building a rectangular shed with a fixed perimeter of 54 feet. What are the dimensions of the **largest shed (area)** that can be built and what is its area?
The primary equation to be maximized is the area of the shed. The perimeter information can be used to write a secondary equation and then substituted into the primary equation.