**Lab: Polynomial Functions**

**Motivation:** A look into optimization done in calculus by constructing the largest rectangle given constraints and the largest volume from a set rectangular piece of paper.

**Objectives:** Students will be able to find quadratic and cubic regression equations to represent the area and volume data gathered.

**Materials:** Lab activity, two pieces of construction paper (1 for each activity), scissors, tape

**Activity 1:** **What dimensions will give you a rectangle with the largest area?**

1. Using one piece of construction paper, cut a rectangle with the property that the sum of the length and the width is 11.
2. Measure the lengths of the sides and calculate the area

Length \_\_\_\_\_\_\_\_\_\_ Width \_\_\_\_\_\_\_\_\_\_ Area \_\_\_\_\_\_\_\_\_\_\_

1. Fill in one row of the table on the board for your groups rectangle.
2. Create a scatter plot of the data from the board. What type of function should be used to model the data?
3. Find a regression function to model the data. Should the domain be restricted?
4. Determine the maximum of this function. What does the maximum represent?

**Activity 2: What dimensions will give you a box with the biggest volume?**

1. Using your second piece of construction paper, cut out congruent squares from each corner. Fold in the sides and use tape to create an open-topped box.
2. Measure the length, width and height of the box and calculate the volume.

Length \_\_\_\_\_\_ Width \_\_\_\_\_\_\_ Height \_\_\_\_\_\_ Volume\_\_\_\_\_\_\_\_

1. Fill in one row of the table on the board for your group’s box.
2. Create a scatter plot of the data. What type of polynomial should be used to model the data?
3. Find a regression equation to model the data. Should the domain be restricted?
4. What is the maximum of this function? What does the maximum represent?