**Notes**

1. A box is to be formed by cutting squares *x* inches from each corner of a rectangular piece of cardboard and folding up the sides. The piece of cardboard is 8.5 inches on one side and 11 inches on the other side.

11

8.5

*x*

*x*

* 1. Using ***V= lwh****, w*rite an equation for the volume of the box, *V*, as a function of *x*.
  2. What is the leading term?
  3. *Without graphing*, describe the global behavior.
  4. *Without graphing*, give the degree of the polynomial and state what this tells you about the number of turning points and horizontal intercepts.
  5. Identify the vertical intercept AND interpret this value in the context of the situation. Does this make sense?
  6. What are the horizontal intercepts (hint: there should be 3)? What is the interpretation of the horizontal intercepts?
  7. Graph the function on your calculator. Adjust the windows accordingly so that the graph shows all horizontal intercepts from **part f**, the vertical intercept from **part e**, and the global behavior from **part c**. Label the axes and draw a sketch of the graph, labeling all intercepts.



* 1. What is a reasonable domain given the context of the situation? Explain.
  2. Graphically find the maximum volume of the box. What is the side length *x* that will produce this maximum volume? Label this point on the graph.

**Definition of Revenue**: The total amount received from selling the product. It is calculated as the price of the product times the quantity of the product sold.

1. The revenue, *R*, in millions of dollars, from the sale of a product is given by the function

, where *p* is the number of units of the product sold in thousands.

1. What is the leading term?
2. *Without graphing*, describe the global behavior.
3. *Without graphing*, give the degree of the polynomial and state what this tells you about the number of turning points and horizontal intercepts.
4. Identify the vertical intercept.
5. What are the horizontal intercepts?
6. Steps to graph the revenue function on the calculator.
7. **After putting the function into “Y=”, do a “Zoom” 6 (Standard window).**

* You shouldn’t see anything at this point. This means that your window is too small.

1. **Adjust the independent (X) values in the “Window” using what you found in part e.**

* Are the horizontal intercepts displayed on the graph?
* Is the global behavior clear on the graph?
* Can all local maximums and/or minimums be seen on the graph?

1. **Continue to adjust the “Window” (larger/smaller Y-values) in order to be able to answer yes to all of the questions above.**
2. Draw a rough sketch of the function’s graph from the calculator. Label both axes and all intercepts with coordinates.



1. Identify a reasonable domain and range for this function given the context of the situation.
2. An open box is to be constructed from a piece of cardboard 20 cm by 40 cm by cutting squares of side length *x* from each corner and folding up the sides.
3. Express the volume *V* of the box as a function of *x*.



1. Draw a graph of the function *V.*

1. Use the graph to find the maximum volume for such a box as well as the side length *x* that will produce this maximum volume.
2. What is the domain of *V*?
3. A market analyst working for a small appliance manufacturer found that if the firm produces and sells *x* blenders annually, the total profit (in dollars) is:



1. What is the leading term? *Without graphing*, describe the global behavior.
2. What is the vertical intercept?
3. Graph the function *P* using an appropriate window. Give a rough sketch below. Be sure to label axes and intercepts.



1. How many blenders must the firm produce to break even?
2. Does profit increase indefinitely as more blenders are produced and sold? If not, what is the largest possible profit and how many blenders produce this largest profit?
3. If you want your company to stay in business, what is a reasonable domain?