Section 5.5: Absolute Extrema
Section Objectives:

- Know the definition of an absolute minimum and maximum
- Know what conditions guarantee a function has an absolute minimum and maximum on an interval.
- Know how to find the absolute extrema of a function on a closed interval
- Use maximization techniques to solve word problems

Practice Problems

1. Sketch the graph of a function on the domain $[3, 6]$ with a absolute maximum at $x = 3$ an absolute minimum at $x = 5$ and a local minimum at $x = 4$.

2. Give an example of a continuous function and an interval where that function has neither an absolute maximum or minimum.

3. Give an example of a function on $[0, 1]$ that has a absolute maximum but no absolute minimum.

4. Find the absolute maximum and minimum values of $f(x) = x^3 - 3x^2 - 2$ on $[-2, 2]$

5. Find the absolute maximum and minimum values of $f(x) = \sqrt{x^2 + 1}$ on (∞, ∞)

6. It has been estimated that a rumor spreads at a rate R that is proportional both to the ratio r of individuals who have heard it and to the ratio $(1-r)$ of those who have not. Thus $R = kr(1-r)$, where k is a positive constant. For what value of r does the rumor spread the fastest?

7. Goal: Find two numbers whose sum is 24 and whose product is maximum.

   (a) Call the two numbers x and y. What is the quantity we want to maximize?

   (b) We only know how to maximize functions of one variable. Use the fact that the sum of the two number is 24 to write y in terms of x.

   (c) Use the previous part to rewrite the function we want to maximize so that it only has one variable.

   (d) Use the techniques we learned in the section to find the maximum value of this function and the values of x and y.

More Practice from Textbook 5.5 You should do as many problems from each set (1-6, 7-10, 11-28, 29-30, 31-38, 43-52), as needed until you are comfortable with these techniques. 43-52 are good practice for application problems.