Quiz 5 Review

Sections 2.8, 3.1-3.4 will be on the quiz.

1. What is the "Extreme Value Theorem"?
2. What is the setup to l'Hospital's rule? (When can you use it?)
3. What is the Closed Interval Method for finding a global max/min?
4. Find the following limits, if they exist:

   (a) $\lim_{x\to 1} \frac{x^2-1}{x^2-x}$

   (b) $\lim_{x\to 1} \frac{x^2+5}{3x+4}$

   (c) $\lim_{x\to 0} \frac{\arcsin(x)}{x}$

   (d) $\lim_{x\to 0} \frac{x2^x}{2^x-1}$

   (e) $\lim_{x\to \infty} \frac{\ln(\sqrt{x})}{x^2}$

   (f) $\lim_{x\to 0} x^3 e^{-x^2}$

5. Let $f(x) = \frac{x^2}{x-2}$.
   Find the exact absolute maximum and absolute minimum on $[3, 7]$.
6. Let $f(x) = x^3 - 3x$

   (a) Locate and classify all local extrema (state which test you're using).

   (b) If we consider only the interval $[0, 2]$, find the global maximum and global minimum.

   (c) Identify any inflection points.

7. Exercise 3, Section 3.1 (Graphing problem)
8. Find two numbers whose difference is 100 and whose product is a minimum.
9. An open box is formed by cutting squares with side lengths of 4 inches from each corner of a square piece of paper. What is a side length of the original paper if the box has a volume of 784 cubic inches?
10. Suppose in a factory that manufactures cardboard boxes, lidless boxes are formed by cutting out squares from each corner of a rectangle cardboard with dimensions 8×5. In order to utilize the given rectangle most effectively, the factory needs to know what size squares should be cut off from each corner. What is the size of the squares being cut off t that gives the maximum volume, and what is the maximum volume?
11. Find the dimensions of the rectangle with perimeter 100 whose area is as large as possible.
12. A model used the for the yield Y of an agricultural crop as a function of the nitrogen level N in the soil is given by:
    $$Y = \frac{kN}{1+N^2}$$
    where $k > 0$ is a positive constant. What nitrogen level gives the best yield?