**Calculus 1** **Assignment 5** **Fall 2013**

This assignment covers the sections "Continuity" and "Maximum and Minimum Values" in Stewart.

1. Evaluate $\lim_{x \to 5} \dfrac{x^2 - 5}{x + \sqrt{5}}$.

2. Find the absolute maximum and minimum values of the function

$$f(x) = 2x^3 - 3x^2 - 12x + 1$$

on the interval $[-3, 0]$.

3. Use the Intermediate Value Theorem to show that there is at least one real solution to the equation

$$e^x = 3 - 2x.$$

4. Calvin is pulling Hobbes in a sled through the snow to Susie's house. Together with Hobbes, the sled weighs 10 pounds. If the rope connected to the sled makes an angle $\theta$ with the ground, then the magnitude of the force with which Calvin must pull the rope is

$$F = \frac{1}{.1 \sin\theta + \cos\theta}.$$

Show that $F$ is minimized when $\tan\theta = .1$.

5. A hiker starts at the bottom of a mountain at 6:30 AM and hikes up a trail to the summit, where he arrives at 6:30 PM. The following morning, he leaves the summit at 6:30 AM and hikes back down the same trail, arriving at the bottom at 6:30 PM. Use the Intermediate Value Theorem to show that there is a point on the trail that the hiker crosses at exactly the same time on both days.