MATH 242: Principles of Analysis
Homework Assignment #9
DUE DATE: Thurs., Dec. 3, start of class.

Homework should be turned in at the BEGINNING OF CLASS. You should write up solutions neatly to all problems, making sure to show all your work. You are strongly encouraged to work on these problems with other classmates, although the solutions you turn in should be your **own** work. Please cite any references (web based or text) that you may have used for assistance with the assignment.

Note: Please list the names of any students or faculty who you worked with on the top of the assignment.

1. Suppose that $f(x) = \begin{cases} x^2 & \text{if } x \in \mathbb{Q} \\ 0 & \text{if } x \notin \mathbb{Q} \end{cases}$

   (a) Show that f is differentiable at $x = 0$ and find $f'(0)$.

   (b) Show that f is not differentiable at any other point.

2. Do the following exercises from the course text *Understanding Analysis* by Stephen Abbott:
   5.2.1, 5.2.2 (parts (a) and (b) only), 5.2.4, 5.2.8 (parts (a) and (b) only), 5.3.2, 5.3.3, 5.3.4, 5.3.5

   Hint: In problem **5.3.4 (b)**, let $x = g(t)$ and $y = f(t)$ for $a \le t \le b$ be parametric equations for a curve in the xy-plane. Then, interpret the second equation in Thm. 5.3.5 graphically by recalling how to find the tangent vector to a parametrized curve.