CS41 Homework 1

This homework is due at 11:59PM on Sunday, September 9. Write your solution using LaTeX. Submit this homework using **github**. This is an individual homework. It's ok to discuss approaches at a high level. In fact, we encourage you to discuss general strategies. However, you should not reveal specific details of a solution, nor should you show your written solution to anyone else. The only exception to this rule is work you've done with a lab partner *while in lab*. In this case, note who you've worked with and what parts were solved during lab.

The main **learning goals** of this lab are to familiarize you with LaTeX, review git and make sure you know how to grab/handin homeworks using git, and to begin to formalize and analyze algorithms.

1. **Algorithm Analysis.** Consider the following algorithm for the Hiking Problem.

   ```
   HIKING()
   1  k = 1.
   2  while you haven't arrived at your friend:
   3        hike k miles north
   4        return to start
   5        hike k miles south
   6        return to start
   7        k = 10k.
   ```

   Describe the distance traveled in HIKING as a function of the initial distance from your friend in the worst case. Express your answer in big-Oh notation. How does this algorithm compare to the algorithms we saw in class?

2. Pick an algorithm you already know (e.g., gradeschool addition or multiplication, or merge-Sort). Describe at a high-level how the algorithm works, and use mathematical LaTeX notation to describe the runtime of the algorithm.

3. Choose a problem you encounter in everyday life (e.g. how to get from your dorm room to Clothier 016 by 8:50AM, or how to get into college) and describe an algorithm for solving that problem.

   Be as specific and descriptive as you can.

4. **(extra challenge problem)** We discussed in class a reason why m is a lower bound for the Hiking Problem. Show that $3m$ is a lower bound for the Hiking Problem.