Name _____

CS200 - Midterm 2 Review Questions

1. Suppose you are creating a password that is 6 characters long, using numbers, upper case letters, and lower case letters. How many passwords are possible, if you want to use 2 numbers, 2 upper case letters, and 2 lower case letters?

2. For many more good practice problems with solutions involving counting, see DMOI Counting Chapter Review.

3. **[11 points]** Find a value n_0, and then prove that for all integers $n \geq n_0$, it is possible to create n-cents worth of postage out of 4-cent stamps and 9-cent stamps. Do not use regular induction. Your n_0 does not need to be the smallest number possible, just any number that works.

4. (Your pseudocode will be graded on correctness, readability, elegance, and appropriate documentation.) Create pseudocode that takes as input a directed graph $G = (V, E)$ in either adjacency matrix or adjacency list form, and tests whether the graph has any self-loops.

Algorithm 1: `AdListFunc`(A)
Input : Adjacency List A of a graph $G = (V, E)$.
Output: True if G has any self-loops, false otherwise.

Algorithm 2: `AdListMat`(A)
Input : Adjacency Matrix A of a graph $G = (V, E)$..
Output: True if G has any self-loops, false otherwise.

5. Let $f : \mathbb{R} \to \mathbb{R}$ be defined as $f(x) = \lfloor x \rfloor$. Explain why $f(x) = \Theta(x)$.

6. Lots more practice problems with big-O in the Rosen chapter on Canvas ("Function Growth.")

7. For more strong induction practice, see DMOI Induction Excercises especially 19, 20.

8. For more "story" (non-mathy) proofs, see DMOI proof and induction chapter exercises.