CS 411: Artificial Intelligence I
Grad Homework 1
Due: Sunday of Week 2 11:59pm

You may discuss the assignment with other students, but if you do you must note on your submission who you discussed it with. The actual submission must be <u>entirely your own work</u>. It must be submitted via gradescope. Please make sure to tag which page(s) each problem is answered on at the appropriate step in the submission process.

1. **Negative costs**

   (a) **Suboptimality**

      Give an example showing that uniform cost search is not optimal if costs can be negative

   (b) **Infinite Loops**

      Give an example where there is no (finite) optimal path if costs can be negative

2. **Iterative Deepening** Give an example with of a graph n nodes where breadth first search and depth first search both expand $O(n)$ nodes while iterative deepening search expands $O(n^2)$ nodes. How can you reconcile this with Question 6 of Written Homework 1?

3. **Completeness of bidirectional search** Prove that bidirectional uniform cost tree search is complete. You may assume there is a single goal state.

Grading standards:

- Full Credit (1.0) - All questions attempted, most with minor or no errors

- Partial Credit (0.5) - A number of questions may have significant errors

- Some Credit (0.25) - Many questions attempted with answers demonstrating some understanding of relevant concepts

- Insufficient evidence (0) - Many questions either not attempted or with answers not demonstrating understanding of relevant concepts