COMPSCI 270 - Artificial Intelligence
Homework Assignment I

Due date: Sep 12

1 Problem 1

Prove that using A* with a heuristic which never overestimates (additively) by more than c will return a solution with cost that exceeds the optimal cost by no more than c.

2 Problem 2

Prove that if you use IDDFS with a branching factor of 10, you will still expand no more than $2\times$ the number of nodes expanded in BFS. We gave an intuitive argument for this in class, but you should formalize it for this homework.

3 Problem 3

Construct an example where RBBFS will perfom a number of node expansions that is order quadratic in the size of the tree.

4 Problem 4

Formulate sorting as a search problem, where the actions are swapping adjacent pairs of numbers. Define the start state, ending state, and actions. What is the branching factor? What is the size of the state space? Define an admissible heuristic that takes O(n) time to compute.

5 Problem 5

Prove that a convex combination of admissible heuristics is admissible.

6 problem 6

Suppose you are trying to find the global minimum of a degree k polynomial by gradient descent and random restarts. Assume you have an oracle that tells you when you've hit the global minimum. In expectation, how many restarts will you need to find the global minimum?