csc384 Fall 2018
Assignment 1 Part II (written part)

Due Friday Oct 5th, 11:59pm

Please submit your written answers to the following questions in a file `a1_writtenAnswers.pdf` using the MarkUs system. When supplying your answers be short and to the point. Excessively verbose answers will have marks deducted. Each question is worth 6 marks divided equally among the different parts (if there are multiple parts).

1. Depth first search on `openMaze` (invoked by `python pacman.py -l openMaze -z .5 -p SearchAgent -a fn=dfs`) takes too long to finish. Yet if depth first search is implemented with full cycle checking it can find a (bad) solution in reasonable time. Why the difference? (Give a short answer).

2. Assume that Pacman is in an NXN maze with no interior walls. (For these question no written explanation is required).

   (a) What is the maximum branching factor in this space?

   (b) What is the length of the longest non-cyclic path in this space.

   (c) With these two numbers give an upper bound on the number of paths that depth first search using path checking will explore in this space.

3. Consider the space requirements of A* search using an admissible heuristic in the Pacman search space. Say that we have generalized the problem so that different actions have different costs and the minimum cost of any action is *cmin*. Also assume that there is no cycle checking.

   Let C^* be the cost of an optimal solution for moving the Pacman from a fixed initial position to a fixed goal position.

What is the maximum number of paths (nodes) that can be on OPEN at any time before A* finds a solution? Give a short explanation of your answer.

4. Assume that A*'s heuristic function $h(n)$ is admissible. For each evaluation function below say whether or not A* with this evaluation function will return an optimal solution or not. If the answer is no, the provide an upper bound for the ratio $\frac{\text{cost of returned solution}}{\text{cost of optimal solution}}$. For this question no written explanation is required.

   (a) $f(n) = g(n) + h(n)$

   (b) $f(n) = g(n) + 3 * h(n)$

   (c) $f(n) = 3 * g(n) + h(n)$