ECS 170 Homework 1

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1. What is the difference among BFS, DFS, and uniform-cost search (Dijkstra's algorithm) with respect to their implementations in the generic tree search algorithm?

   (a) BFS uses a FIFO structure for the fringe.

   (b) DFS uses a LIFO structure for the fringe.

   (c) Uniform-cost search uses a priority FIFO structure for the fringe.

2. Assuming there aren't any programming bugs, what is the most likely reason uniform cost search will sometimes return a greater cost path than depth first search?

   If the branching factor is large, most of the path costs are small, but a then UCS will explore many small-cost branches before exploring a any large-cost branches. If the small-cost branches find a path to the goal, UCS will choose this path as a solution, even though the overall cost would be greater than any large-cost branches

3. Given this information (and assuming there aren't any programming bugs) what is the most likely reason A* would return a greater cost path than Dijkstra's Algorithm?

   A* can have a greater cost path than UCS if we choose a heuristic function which overestimates the cost to reach the goal. It's possible that there is some path on the optimal solution that would have an overestimation for the heuristic. A* would not expand this path, and instead attempt to find some other path. UCS on the other hand would just expand the path like any other.

4. Consider the two statements (a) BFS is a special case of uniform cost search, and (b) uniform cost search is a special case of A*. Under what conditions are they true?

   (a) BFS is a special case of UCS when the cost function is constant.

   (b) UCS is a special case of A* when the heuristic function is constant.