Allister Liu
ECE-469
HW 1

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1. a) Go
   i) fully observable ✓
   ii) strategic ✓
   iii) sequential ✓
   iv) semi-dynamic if timer ✓
   v) discrete ✓
   vi) multi-agent ✓
   vii) entire percept history ✗ why? without explanation, seems wrong. choice depends on current state of game

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(-1)

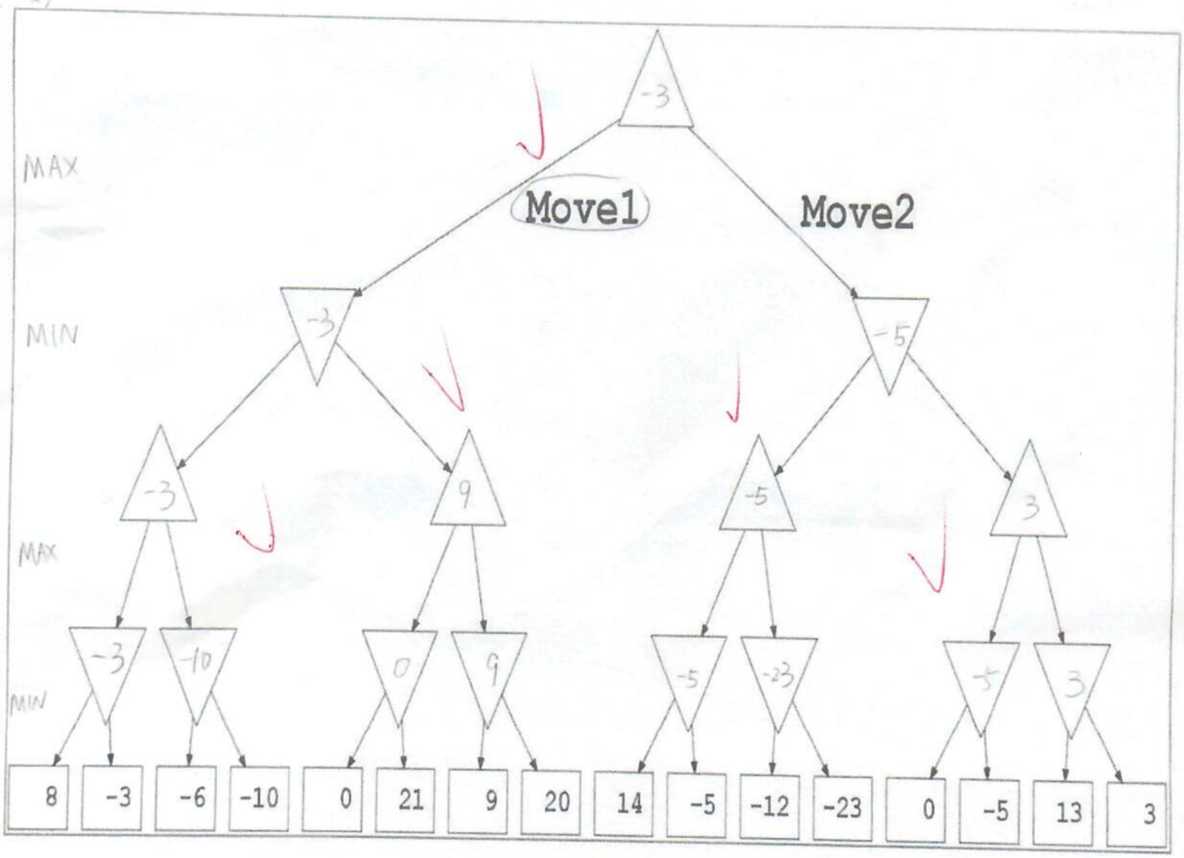
   b) Tenga
   i) partially observable ✓
   ii) deterministic ✗ real world, anything can happen
   iii) sequential ✓
   iv) ~~semi-dynamic~~ evaluation doesn't change while thinking
   v) continuous ✓
   vi) single-agent ✓
   vii) current percept debatable, I'll accept it

(-3)

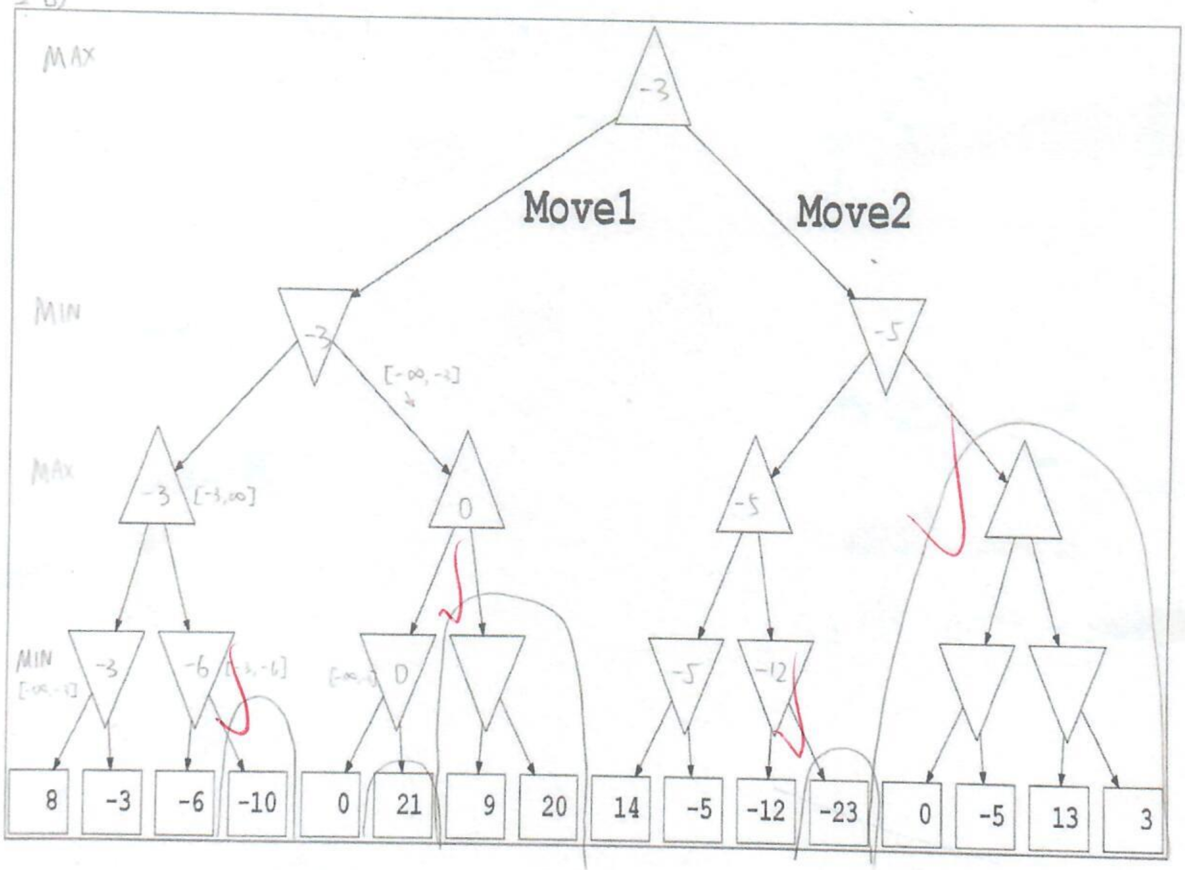
   c) Face recognition
   i) fully observable ✓
   ii) deterministic ✓
   iii) episodic ✓
   iv) semi-dynamic ✗ why?
   v) continuous ✓
   vi) single agent ✓
   vii) entire percept history ✗ image is entire percept, training is done

(-3)

2 a)


MAX
MIN
MAX
MIN
Move1
Move2
-3
-3
-5
-3
9
-5
3
-3
-10
0
9
-5
-23
-5
3
8
-3
-6
-10
0
21
9
20
14
-5
-12
-23
0
-5
13
3

2 b)


MAX
-3
Move1
Move2
MIN
-3
-5
[-∞, -3]
MAX
-3
[-3,∞]
0
-5
MIN
[-∞, -3]
-3
-6
[-3, -6]
[-∞, -3]
0
-5
-12
8
-3
-6
-10
0
21
9
20
14
-5
-12
-23
0
-5
13
3

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2 c) If both player plays perfectly, MIN will win the game. Because the minimax value is negative, which means if both players play the game perfectly, MIN will always win the game.

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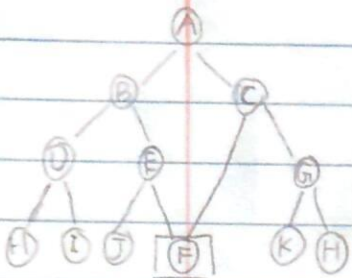
3. a) DFS is complete but not optimal. Because the maze is of size $N \times M$ — finite space, and by remembering nodes on the current path, we can avoid cycles. Therefore DFS is able to perform a complete search.



If a case on the left occurs where A is the enterance and F is the exit, DFS will find A-B-E-F as solution, rather A-C-F which is the optimal solution.

b) BFS is complete and optimal. Because there is a finite branching factor, BFS can perform a complete search. Since the ~~path~~ step cost is constant (path cost is a non-decreasing function of depth), ~~D~~BFS is optimal.

I'm sure that's what you meant

c) H_1, H_2, H_3 would guarantee that the graph search version of A^* search is optimal. It is optimal with a ADMISSIBLE HEURISTIC as long as repeated paths to a state with better costs are not discarded. The shortest (most ideal) path from (x,y) to (N,M) is $N-x+M-y$ (H_2). $H_1 = 0 < H_2$ $H_3 = \sqrt{(N-x)^2+(M-y)^2} < H_2$ by Pythagorean Theorem. $H_4 = (N-x) \times (M-y) > H_2$ ($N \geq x, M \geq y$, x, y, M, N are all positive integers).

d) $H_2(n) = N - x + M - y$ is the best one to use with the graph search version of A^*, because without overestimating, H_2 is the longest (out of H_1, H_2, H_3).

it dominates