# CSE 5525 Artificial Intelligence II

## Homework #1: A* Search and Minimax

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Your Name: ____________________ OSU Username: ______________

1. (**3 points**) Assume we run $\alpha - \beta$ pruning expanding successors from left to right on a game with tree as shown in Figure 1 (a). Then we have that:

   (a) (*true* or *false*) For some choice of pay-off values, no pruning will be achieved (shown in Figure 1 (a)).

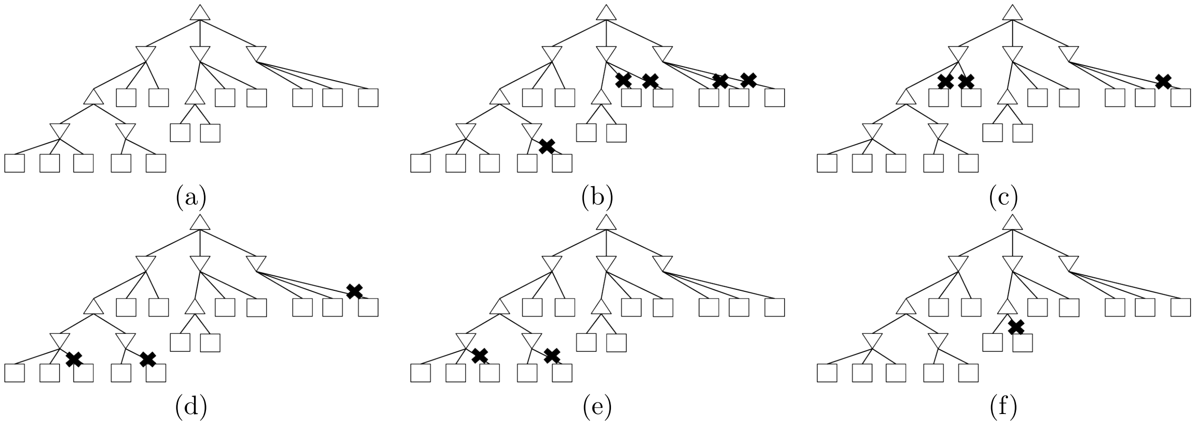
   (b) (*true* or *false*) For some choice of pay-off values, the pruning shown in Figure 1 (b) will be achieved.

   (c) (*true* or *false*) For some choice of pay-off values, the pruning shown in Figure 1 (c) will be achieved.

   (d) (*true* or *false*) For some choice of pay-off values, the pruning shown in Figure 1 (d) will be achieved.

   (e) (*true* or *false*) For some choice of pay-off values, the pruning shown in Figure 1 (e) will be achieved.

   (f) (*true* or *false*) For some choice of pay-off values, the pruning shown in Figure 1 (f) will be achieved.



(a) (b) (c) (d) (e) (f)

Figure 1: Game trees.

2. The following implementation of graph search may be incorrect. Circle all the problems with the code.

```
function GRAPH-SEARCH(problem, fringe)
    closed ← an empty set,
    fringe ← INSERT(MAKE-NODE(INITIAL-STATE[problem]), fringe)
    loop
        if fringe is empty then
            return failure
        end if
        node ← REMOVE-FRONT(fringe)
        if GOAL-TEST(problem,STATE[node]) then
            return node
        end if
        ADD STATE[node] TO closed
        fringe ← INSERTALL(EXPAND(node,problem), fringe)
    end loop
end function
```

(a) Nodes may be expanded twice.

(b) The algorithm is no longer complete.

(c) The algorithm could return an incorrect solution.

(d) None of the above.

3. (**2 points**) The following implementation of A$^*$ graph search may be incorrect. You may assume that the algorithm is being run with a consistent heuristic. Circle all the problems with the code.

```
function A*-SEARCH(problem, fringe)
    closed ← an empty set
    fringe ← INSERT(MAKE-NODE(INITIAL-STATE[problem]), fringe)
    loop
        if fringe is empty then
            return failure
        end if
        node ← REMOVE-FRONT(fringe)
        if STATE[node] IS NOT IN closed then
            ADD STATE[node] TO closed
            for successor IN GETSUCCESSORS(problem, STATE[node]) do
                fringe ← INSERT(MAKE-NODE(successor), fringe)
                if GOAL-TEST(problem,successor) then
                    return successor
                end if
            end for
        end if
    end loop
end function
```

(a) Nodes may be expanded twice.

(b) The algorithm is no longer complete.

(c) The algorithm could return an incorrect solution.

(d) None of the above.