

CARNEGIE MELLON UNIVERSITY 07-280

HOMEWORK 2

DUE: Thursday, September 10, 2026

<https://www.cs.cmu.edu/~07280>

INSTRUCTIONS

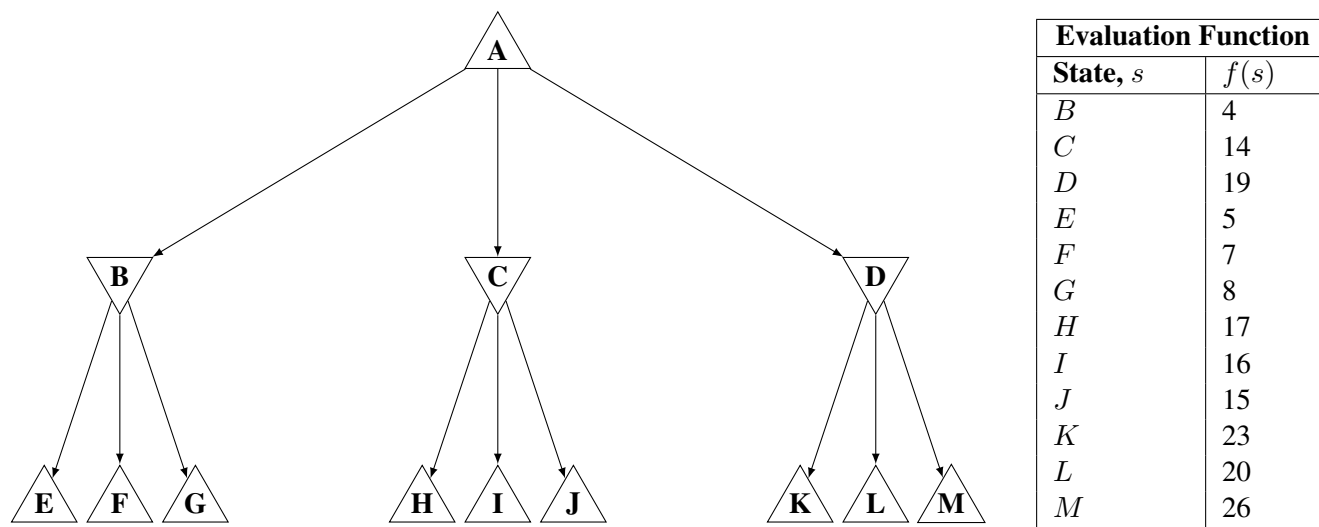
- **Format:** Use the provided LaTeX template to write your answers in the appropriate locations within the *.tex files and then compile a pdf for submission. We try to mark these areas with STUDENT SOLUTION HERE comments. Make sure that you don't change the size or location of any of the answer boxes and that your answers are within the dedicated regions for each question/part. If you do not follow this format, we may deduct points.

You may also digitally annotate the pdf. Illegible handwriting will lead to lost points. However, we suggest that try to do at least some of your work directly in LaTeX.

- **How to submit written component:** Submit to Gradescope a pdf with your answers. Again, make sure your answer boxes are aligned with the original pdf template.
- **How to submit programming component:** See section Programming Submission for details on how to submit to the Gradescope autograder.
- **Policy:** See the course website for homework policies, including late policy, and academic integrity policies.

Name	
Andrew ID	
Hours to complete all components (nearest hour)	

1 [22 pts] Alpha-Beta Pruning with Iterative Deepening



Iterative deepening may be combined with pruning in game trees to increase the pruning and speed up the search. To see how this works, we are going to prune the above fragment of a tree using the following steps:

- (i) Select the order of the min-node children, B , C , D , based on the values of the evaluation function of those states, $f(B)$, $f(C)$, $f(D)$. Specifically, using the evaluation function of the children (not the grandchildren), order the children from best to worst evaluation function value, **from the perspective of the parent node**.
- (ii) Prune the (sub-)tree using the resulting order and **limiting the depth to the grandchildren**($E/F/G/\dots$), using the evaluation function on the grandchildren as their value.

1. [6 pts] What would the resulting order of the subtrees be?

☐ B then C then D ☐ C then D then B ☐ D then C then B

2. [8 pts] Prune the tree with this new ordering of the child subtrees. (Grandchildren are still visited left to right.) Write in the box below the nodes that would *NOT* be visited because of pruning. **Note:** It might be helpful to sketch a new version of tree with the child subtrees reordered.

Nodes

Iterative deepening would then repeat steps (i) and (ii) one level deeper, but skipping any subtrees that were pruned.

3. [8 pts] When alpha-beta pruning is applied to a minimax tree, it is guaranteed to return the same move that standard minimax without pruning would return. This is because it prunes away branches that cannot possibly influence the final decision.

Is this iterative deepening with pruning method also guaranteed to return the same move as standard minimax on the complete tree? Briefly explain your reasoning.

☐ Yes ☐ No

Explain

2 Collaboration Policy

After you have completed all other components of this assignment, report your answers to the following collaboration questions.

1. Did you receive any help whatsoever from anyone in solving this assignment? If so, include full details including names of people who helped you and the exact nature of help you received.

Your Answer

2. Did you give any help whatsoever to anyone in solving this assignment? If so, include full details including names of people you helped and the exact nature of help you offered.

Your Answer

3. Did you find or come across code that implements any part of this assignment? If so, include full details including the source of the code and how you used it in the assignment.

Your Answer