

# ECS 170 Homework 3

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1. We discussed the  $\alpha - \beta$  pruning technique for improving the runtime of the minimax algorithm. Given a game tree with maximum depth  $m$ , branching factor  $b$ , and minimum depth of an optimal state  $d$ :
  - (a) What is the worst case runtime?  
The worst case runtime is  $O(b^m)$ .
  - (b) What is the best case runtime?  
The best case runtime is  $O(b^{\frac{m}{2}})$
  - (c) Under what condition can we achieve best case runtime?  
The best case can be achieved if we examine the best successors first.
2. Consider the following min-max game tree.
  - (a) Execute  $\alpha - \beta$  pruning on the example. First, write the minimax value at each node. Then cross out the branches that get pruned by  $\alpha - \beta$  pruning. If a branch does get pruned, circle the nodes under that branch that you had to explore in order to decide to prune the branch.