

Question 1: Reflex Agent

1. The heuristic value of a game state is a linear combination of game features that maximizes the chances of winning for a player. A good heuristic value for a game state is one that keeps the player in a better position for winning and the adversaries in a losing position. For A* search, a heuristic value indicates how close the next state to the goal state is. A good heuristic for A* is admissible, optimal, and consistence. Typically, lower heuristics values are desired for A* search.

Question 2: Minimax

1. When death is inevitable and score is decreasing with time, Pacman will choose to commit suicide in order to maximize the score since the evaluation function for a minimax algorithm only cares about maximizing the score.
2.
 - a) not same
 - b) not same
 - c) not same

Question 3: Alpha-Beta Pruning

1.
 - a) In the best case scenerio, Alpha-Beta will prune everything except the left most branch. It will reduce the time complexity to $O(b^{d/2})$. Time complexity for minimax is $O(b^d)$; therefore, we can see that alpha-beta will be able to traverse through twice the depth ($2d$) as minimax would in the same amount of time.
 - b) The worst case happens when alpha-beta never gets to prune any node or branch which means the search reduces to a minimax algorithm. Therefore, both minimax and alpha-beta will search through a depth of d in the same amount of time. Technically, alpha-beta will perform slightly worse than minimax in this case since it has to do extra comparisons. However, they would both have a time complexity of $O(b^d)$.
2. False