1. Describe how one can calculate the advanced heuristic value for any state of the puzzle.

   I find the distance between the current position and the goal position of the 4 by 4 piece. I add that distance with depth + 1 to determine which level of the search tree I am looking at. Thereby, my final heuristic is the distance between the goal and the current position of the 4 by 4 piece added with the depth + 1.

2. Why is your advanced heuristic admissible?

   This heuristic is admissible because it assumes there is an absence of other pieces on the board. The lack of obstacles on the board would allow the 4 by 4 piece to easily move the goal position. Knowing the distance, it has to travel, the 4 by 4 piece can easily be moved since there is no other piece blocking it from reaching the goal position.

3. Why does your advanced heuristic dominate the Manhattan distance heuristic?

   To verify that my heuristic is the dominating one, I need to verify the two conditions.

   a) Condition 1: For every state, my heuristic value is greater than or equal to the Manhattan distance. The Manhattan distance simply takes the difference between the goal and the current position. Since my heuristic adds this value with depth + 1, I ensure that the value is always larger. This is guaranteed by the additional 1 term which would make the heuristic at the first node a guaranteed 1.

   b) Condition 2: Determine a state at which my heuristic produces a strictly higher value. For the initial state at the root node, my heuristic will produce a higher value because it is being added with one so even though the depth is 0, the final heuristic will always be one greater by virtue of the additional one term.