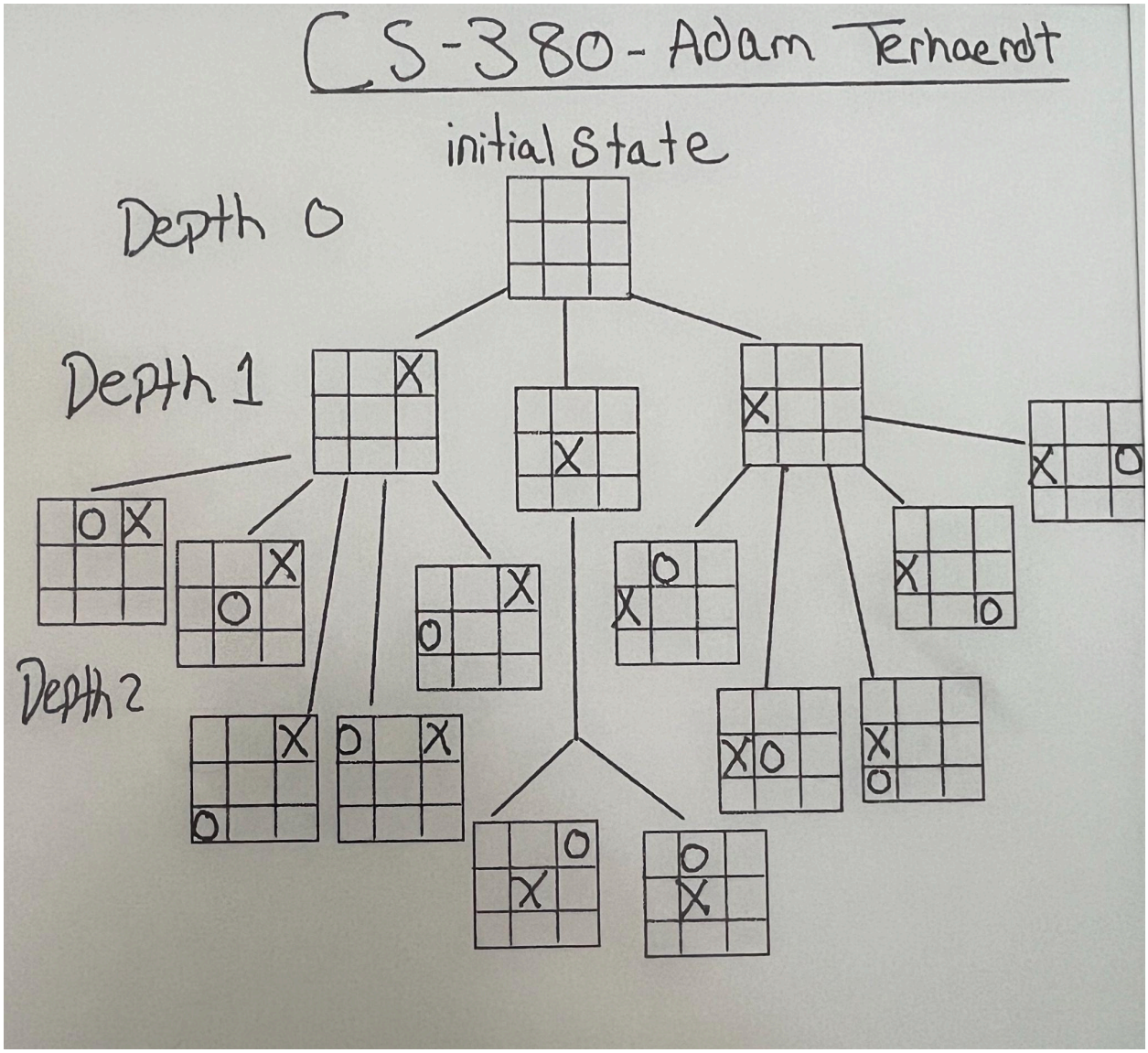
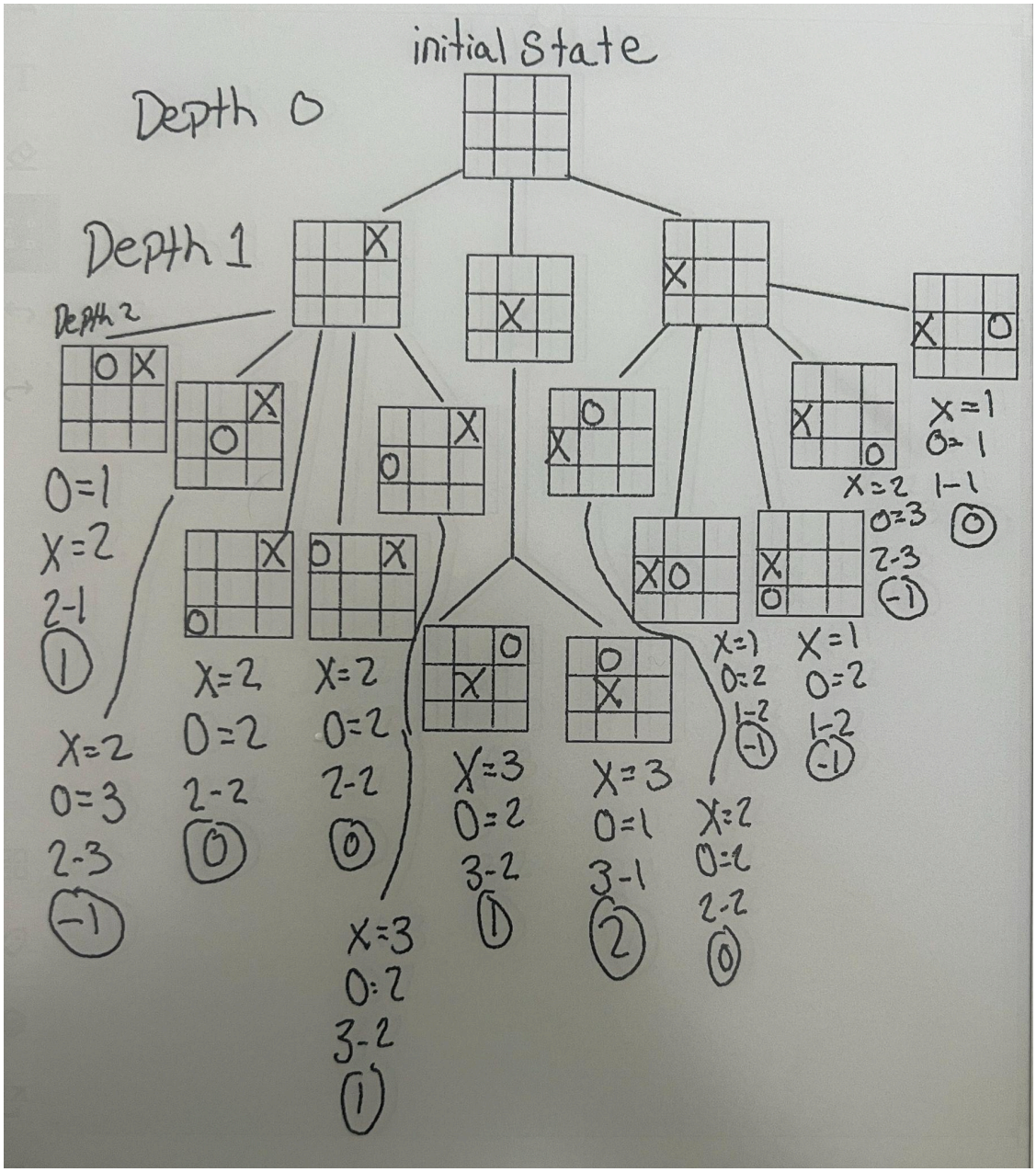
Assignment 4 Written Problems

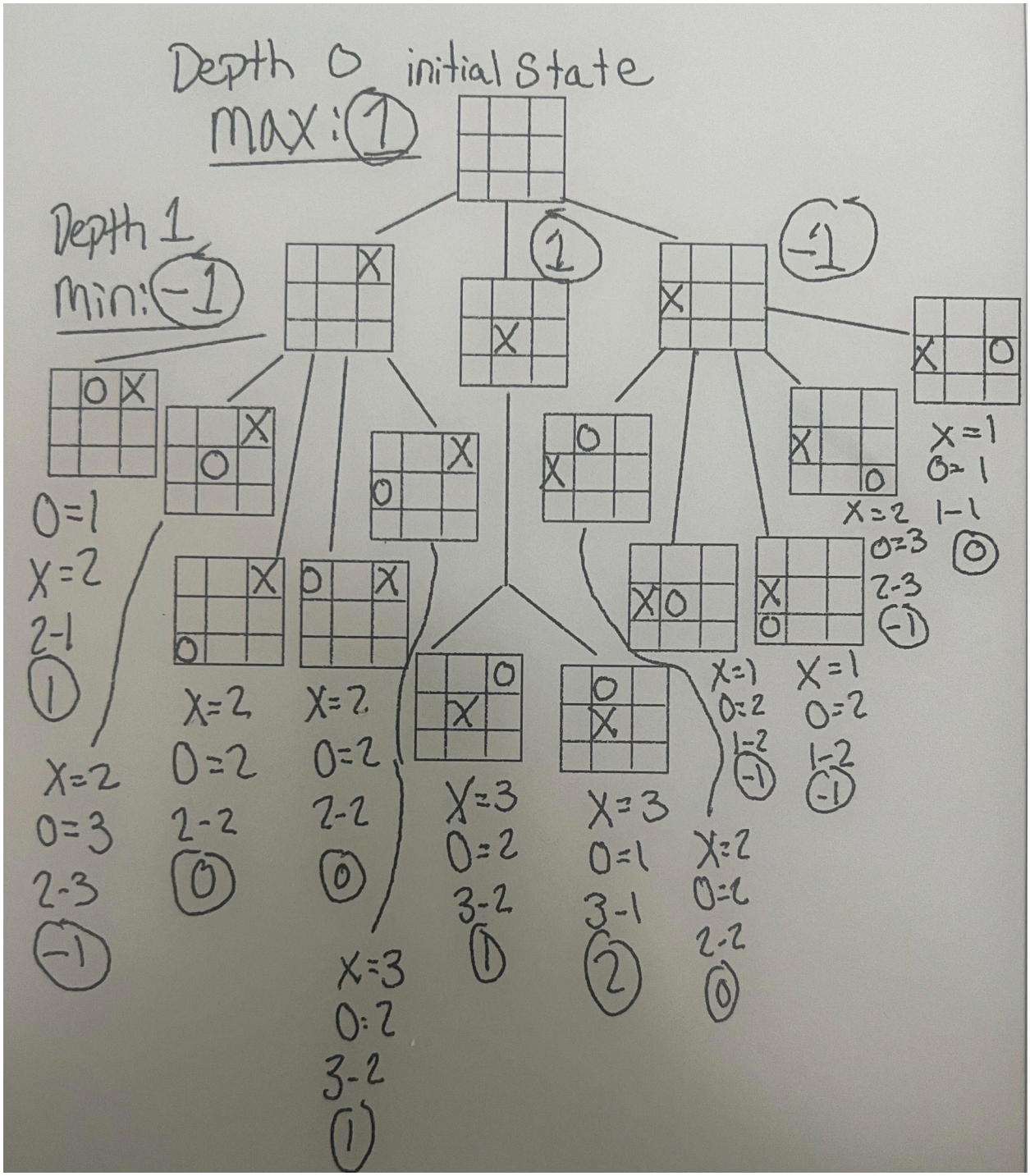
Adam Terhaerdt
CS-380
03-01-2025

1. My initial reaction was that there are 9! amount of possible states equalling 362,880 possible states. This is because after you make you first move there are now 8 possible moves you could make so 9 * 8 * 7… would make sense. This answer does not include terminal states, as some states are impossible to reach.
2. 

3. This drawing shows the evaluations calculated at depth of 2. For every possible row, column, or diagonal win either o or x had I added +1 to that specific piece's score and then took the difference.



4. Using the minimax algorithm I was able to determine at depth 1 and 2 which values would have been taken. At depth 1, I took the minimum value from depth 2, and at depth 0, I took the maximum value from depth 1.



5. I did not redraw the graph so that alpha-beta pruning would be in the optimal order. I was able to determine that 8 graphs would be pruned at depth 2. The reason I was able to do this is because let's say the middle path was taken first. I would look at 1 and 2 first and determine the minimum being 1. Then whether the right or left path at depth 1 is taken, I would see a -1. Since I know 1 > -1I can automatically skip all of the other nodes in this path because no matter what -1 or smaller will come from the minimum, meaning 1 would have to be selected in the maximum phase.