CS171
Quiz 2: Recursion, Sorting, Algorithm Analysis

Name:______________

Problem 1. (40 points)
1. Briefly describe how mergesort algorithm works.
2. Given an array of integers: 3, 5, 9, 2, 6, 8, 1, 7, show the key intermediate steps of how the array gets sorted.
3. The runtime cost for mergesort is given as the following recurrence relation.

\[ T(N) = 2T(N/2) + N \]
\[ T(1) = 0 \]

Solve the recurrence relation, and derive the Big-O notation.

Problem 2. (30 points)
1. Briefly describe how quicksort algorithm works.
2. Given an array of integers: 3, 5, 9, 2, 6, 8, 1, 7, show the key intermediate steps of how the array gets sorted.
3. What’s the average runtime cost of quicksort in big O notation? (You do not have to show the recurrence relation and intermediate steps.)

Problem 3. (30 points)
1. Briefly describe how binary search algorithm works given a sorted array.
2. Given a sorted array of integers: 1, 2, 3, 4, 5, 6, 7, 8, show the comparisons that have to be done if the search key is 3.
3. What’s the cost function in recurrence relation for binary search? (You do not have to solve it.)