Homework 4
CS 3385

1. Show the recursion tree for $T(n) = 4T(n/2) + c$ and derive the solution using big-Theta notation. Note: the recurrence is *not* $T(n) = 4T(n/4) + c$.

2. Show the recursion tree for $T(n) = 4T(n/4) + c$ and derive the solution using big-Theta notation. Explain the intuition why this result is different from the solution of $T(n) = 4T(n/2) + c$.

3. Show the recursion tree for $T(n) = 4T(n/4) + n$ and derive the solution using big-Theta notation. Explain the intuition why this result is different from the solution of $T(n) = 4T(n/4) + c$.

4. Use the master method to give tight asymptotic bounds for the following recurrences.

   (a) $T(n) = 2T(n/4) + 1$
   (b) $T(n) = 2T(n/4) + \sqrt{n}$
   (c) $T(n) = 2T(n/4) + n$
   (d) $T(n) = 2T(n/4) + n^2$

5. Consider the binary search algorithm (see problem 5 from hw1).

   (a) Give the recurrence for binary search. Explain.
   (b) Use the master method to show that the solution to the recurrence is $T(n) = \Theta(\lg n)$.