1. [4 points] True or False:
   ____ When we say that a problem is in the class NP, we mean that it cannot be worked in polynomial time.
   ____ There are cases where bubblesort is the fastest sorting method for that situation.

2. [10 points] Which of the following answers best describes the running time of each of the following code fragments: $O(\log n), O(n), O(n \log n), O(n^2)$,

\[
\text{for (i=1,i<n,i++)} \\
\text{for (j=i, j<i, j++)} \\
\text{cout << Hello World << endl;}
\]

\[
\text{for (i = 1,i<n,i=2*i)} \\
\text{for (j=1, j<i, j++)} \\
\text{cout << Hello World << endl;}
\]

3. [10 points] Fill in the blanks:
   \_______________ and \_______________ are examples of divide-and-conquer sorting algorithms.

4. [5 points] In the decision tree model of composition, no algorithm which sorts n items can have fewer than \_____________ comparisons in the worst case.

5. [5 points] When an item is deleted from a stack, it is always the most recently inserted item. On the other hand, when an item is deleted from a queue, it is always \_____________ which is deleted.

6. [5 points] There are several techniques for balancing binary search trees. If T is a balanced binary search tree, the time it takes to execute a "find" in T is \_____________. (Give an asymptotic answer.)

7. [6 points] Suppose $F(n) = 2F(n/2) + 5n$. Then $F(n) =$ \_____________ (Give an asymptotic answer.)

8. [5 points] There is a programming technique called \_____________ which consists of solving subproblems of increasing complexity, where each subproblem can be solved using the solutions to previously solved subproblems.