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: $O(\log n), O(n), O(n \log n), O(n^2)$,

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

3. [10 points] Fill in the blanks:
   \[
   \text{________________________ and ____________________ are examples of divide-and-conquer sorting algorithms.}
   \]

4. [5 points] In the decision tree model of composition, no algorithm which sorts $n$ items can have fewer than \underline{________} 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 \underline{________} 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 \underline{________} . (Give an asymptotic answer.)

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

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