CS344 Spring 2015 Quiz 2 (Take-Home/Open Book)
Due: March 24, 2015 (before class).

You may consult the textbook or course notes but the submitted work must be your own.

Consider the problem of maintaining the set of integers $\{1, 2, ..., N\}$ in a data structure S. Here are the options for S:

- S_1 is a binary search tree.
- S_2 is an AVL tree.
- S_3 is a splay tree.
- S_4 is a max-heap.

Suppose that the integers are added to the data structure in ascending order. For the heap S_4, the integers are given as input by the sorted array $[1, 2, \ldots, N]$.

For each question, circle the correct answer (True or False). All statements are in the asymptotic worst-case sense. Explain your answers.

1. (True/False) After the N insertions, the height of S_1 is $O(\log N)$.
2. (True/False) After the N insertions, the height of S_2 is $O(\log N)$.
3. (True/False) After the N insertions, the total comparison cost to build S_3 is $O(N)$.
4. (True/False) The comparison cost to build S_4 is $O(N)$.
5. (True/False) After the N insertions, the root of S_1 holds the integer N.
6. (True/False) After the N insertions, the root of S_2 holds the integer N.
7. (True/False) After the N insertions, the root of S_3 holds the integer N.
8. (True/False) After S_4 is built, the root holds the integer N.