CSC 226 SPRING 2017
ALGORITHMS AND DATA STRUCTURES II
ASSIGNMENT 1
UNIVERSITY OF VICTORIA

1. Consider a comparison based sorting algorithm for sorting an input of n numbers $x_1 x_2 \ldots x_n$ where n is even. Suppose that the sorting algorithm is also given the following additional information: $x_1, x_3, \ldots, x_{n-1}$ will be in the first half of the sorted order and $x_2, x_4, \ldots, x_n$ will be in the second half of the sorted order. Show that any comparison based sorting algorithm still requires $\Omega(n \log n)$ time ot sort $x_1 x_2 \ldots x_n$ even if it is given this additional information.

2. Recall the LinearSelect algorithm we learnt in the class. Suppose that we modify the algorithm to use groups of size 3 instead of 7. Show that the modified algorithm does not run in $O(n)$ time.

3. Starting with an empty tree, construct an AVL tree by inserting the following keys in the order given: $2, 3, 5, 6, 9, 8, 7, 4, 1$. If an insertion causes the tree to become unbalanced, then perform the necessary rotations to maintain the balance. State where the rotations were done.

4. Consider an AVL tree T on n nodes. Consider a leaf that is closest to the root of T. Suppose that this leaf is at level k. Then show that the height of the tree T is at most $2k - 1$.