Homework 3: Many Campers Sort Piles

Attempt all of the problems that seem interesting, and let me know if you see any typos! (+) problems are harder than the others. (++) problems are currently open.

1. Consider the following rule for deterministically choosing a pivot element in quicksort: given a list of n elements, choose the "middle" element (i.e. the element at location $\lfloor n/2 \rfloor$.) Create a list that needs n runs of this quicksort to be sorted.

2. Prove the claim we made in class about the treeTest algorithm: that it takes 3^n many steps to complete its study of the tree, on average.

3. Can you do better than this? In other words, can you make an algorithm for the treeTest problem that runs in $O(c^n)$ time, for some constant $c < 3$?