

# CPS 130 Homework 10

## Binary Search Trees and Review

due Thu May 30th

*Write and justify your answers in the space provided.*<sup>1</sup>

1. (CLRS 12.2-5) Show that if a node in a binary search tree has two children, then its successor has no left child and its predecessor has no right child.

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<sup>1</sup>Collaboration is allowed, even encouraged, provided that the names of the collaborators are listed along with the solutions. Students must write up the solutions on their own.

2. (CLRS 12-2 - Radix trees) Show how to use a radix tree to sort  $S$  lexicographically in  $O(n)$  time.

3. (CLRS 9-1) Given a set of  $n$  numbers, we wish to find the  $i$  largest in sorted order using a comparison-based algorithm. Find the algorithm that implements each of the following methods with the best asymptotic worst-case running time, and analyze the running times of the algorithms on terms of  $n$  and  $i$ .
- (a) Sort the numbers, and list the  $i$  largest.
  - (b) Build a max-priority queue from the numbers, and call EXTRACT-MAX  $i$  times.
  - (c) Use an order-statistics algorithm to find the  $i$ th largest number, partition around the number, and sort the  $i$  largest numbers.

4. (*extra credit*) (CLRS 8-2)