PHYS 483 Problem Set 4

Date: Tuesday, March 25th, 2003
Due date: Tuesday, April 1st, 2003
Reading: Introduction to Algorithms, section 7.5, pp 149-150.

- **Problem 1** [5x20 points] *Introduction to Algorithms, page 152, problem 7-2*

A **d-ary heap** is like a binary heap, but instead of 2 children, nodes have d children.

(a) How would you represent a d-ary heap in an array?

(b) What is the height of a d-ary heap of n elements in terms of n and d?

(c) Give an efficient implementation of EXTRACT-MAX. Analyze its running time in terms of d and n.

(d) Give an efficient implementation of INSERT. Analyze its running time in terms of d and n.

(e) Give an efficient implementation of HEAP-INCREASE-KEY(A, i, k) which sets $A[i] \leftarrow max(A[i], k)$ and updates the heap structure appropriately. Analyze its running time in terms of d and n.