PHYS 483 Problem Set 2

Date: Tuesday, March 11th, 2003
Due date: Tuesday, March 18th, 2003

• **Problem 1** [30 points] *Introduction to Algorithms, page 15, exercise 1.3-5*
Referring back to the searching problem, observe that if the sequence A is sorted, we can check the midpoint of the sequence against v and eliminate half of the sequence from further consideration. **Binary search** is an algorithm that repeats this procedure, halving the size of the remaining portion of the sequence each time. Write pseudocode, either iterative or recursive, for binary search. Argue that the worst-case running time of binary search is $\Theta(\lg n)$.

• **Problem 2** [40 points] *Introduction to Algorithms, page 16, exercise 1.3-7*
Describe a $\Theta(n \lg n)$-time algorithm that given a set S of n real numbers and another real number x, determines whether or not there exist two elements in S whose sum is exactly x.

• **Problem 3** [30 points] *Introduction to Algorithms, page 37, exercise 2.2-6*
Which is asymptotically larger: $\lg \lg^* n$ or $\lg^* \lg n$?