Boğaziçi University
Department of Physics

Phys 499 Spring 2007

Problem Set #2

Due in class Wednesday, 21 Mar 2007

> **Note:** Submit your *C* codes in printed form with an example of input and output data set. Send the codes by email. Do not compress the source codes.

Problem 1: – 10 pts
Write a C code to implement the bubblesort that sorts a set of records with elements `key` and `name` where `key` is a number, and `name` is a 16-byte string. Sort it with respect to the value of key. Implement the code such that it does not move the actual data, but simply reorders the pointers that point to the set of the records. Keep in mind that in real life the records will be much longer and it is expensive (CPU wise) to move the data around.

Problem 2: – 30 pts (Exercise 2.3-5)
Referring back to the searching algorithm (see Exercise 2.1-3), 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 the worst-case running time of binary search $\Theta(\lg n)$.

Problem 3: – 25 pts
Implement the above pseudocode in C.

Problem 4: – 35 pts (Exercise 2.3-7)
Describe a $\Theta(n \lg n)$-time algorithm that, given a set S of n integers and another integer x, determins whether or not there exist two elements in S whose sum is exactly x.