

Homework #2  
Introduction to Algorithms/Algorithms 1  
600.363/463

**Due on Friday, March 9th, 11:59 a.m. (NOON)**

**Where to submit:** the mailbox accross 224 NEB  
**Late submissions:** will NOT be accepted

**Format:** Please start each problem (1,2,3,4,5,6,7,8) on a new page.  
Please type your answers (instead of handwriting) *if you can*.  
**Electronic submissions will NOT be accepted**

**Note:** PROBLEM NUMBERS REFER TO THE COURSE TEXTBOOK  
(CLRS, 3rd Edition.)

February 24, 2012

## 1 Correctness of BUBBLESORT

Prove the correctness of *bubble sort* by either using *induction* or using the *loop invariant*. (You may refer to Problem 2-2 for the *pseudocode* of this sorting algorithm).

## 2 Comparing Sorting Algorithms

Compare each *pair* of the following algorithms in terms of *advantages and disadvantages*: quick sort, insertion sort, bubble sort, bucket sort, merge sort.

### **3 Finding the Number of Distinct Array Elements**

Assume that you are given an array  $A[1 \dots n]$  which may have duplicates, i.e.,  $A[i] = A[j]$  for some values of  $i$  not equal to  $j$ . Design an algorithm to find the number of distinct elements in  $A$ , i.e. the cardinality of the set  $\{A[1], A[2], \dots, A[n]\}$ .

#### **4 Exercise 2.1-3**

(You can use induction instead of the loop invariant method to prove correctness)

#### **5 Exercise 2.3-5**

#### **6 Exercise 2.3-6**

#### **7 Problem 2-4**

#### **8 Problem 4-1**

(Apply the master theorem.)