

**CS 332: Algorithms**  
**Exercise #1**

**Assigned:** Tuesday, October 17

**Due:** Thursday, October 19 **in class**

**Description:** Below are two problems. Your goal is to attempt to solve these problems, while documenting the solution process. The output should be an *annotated solution*: a solution along with a detailed description of how you solved the problem. Keep track of each step you take, the decisions you make (and why you make them), and any “wrong turns”, then write up the annotated solution with enough clarity that I can follow your thought process. Good documentation is more important than the right answer. My goals for this exercise are (1) to assess how you approach and solve problems and (2) to help you understand and describe your problem-solving methods. I will try to distill some useful advice on solving these problems from the exercises, and provide that advice (probably via e-mail) in time to help with the midterm.

**Time Limit:** Do not spend more than 90 minutes working on this exercise.

**Grading:** This exercise is worth 5 points (that is, half of a regular homework assignment). You will not receive a grade for this exercise; you get the credit just for handing it in. Think of this as an easy 5 points of extra credit. Caveat: if you don't do a complete enough job, you may have to do it over.

**Problems:** 1. Solve the following recurrence by substitution:

$$T(n) = T\left(\frac{n}{2} + \sqrt{n}\right) + n$$

2. An array  $A[1..n]$  contains  $n$  distinct elements that are randomly ordered, with each permutation of the  $n$  elements equally likely. What is the expected value (see Section 6.3) of the index of the maximum element in the randomly ordered array? What is the expected index of the minimum element?