Algorithms Autumn 2011
Problem Set #5 Instructor: Anna Karlin
Due on **November 10, 2011**.

Instructions: You are allowed to brainstorm on ideas for solving these problems with fellow students taking the class. You may also collaborate with at most one other classmate on writing up your solutions. If you do collaborate in any way, you must acknowledge for each problem the people you worked with on that problem. Please do not post solution ideas to discussion boards – discussion boards can be used to clarify the problems and perhaps to discuss specific examples. People shouldn't be able to find solutions (even partial solutions) to the problems on the dicussion board.

The problems have been carefully chosen for their pedagogical value and hence might be similar or identical to those given out in past offerings of this course at UW, or similar courses at other schools. Using any pre-existing solutions from these sources, from the Web or other algorithms textbooks constitues a violation of the academic integrity expected of you and is strictly prohibited.

Most of the problems require only one or two key ideas for their solution – spelling out these ideas should give you most of the credit for the problem even if you err in some finer details. So, make sure you clearly write down the main idea(s) behind your solution even if you could not figure out a complete solution.

Be sure to carefully read the grading guidelines page linked off the course web page.

A final piece of advice: Begin work on the problem set early and don't wait till the deadline is only a few days away.

Readings: Kleinberg and Tardos: Chapter 6, Start Chapter 7.

Each problem is worth 10 points unless noted otherwise. All problem numbers refer to the Kleinberg-Tardos textbook.

1. The value of an arithmetic expression depends on the order in which the operations are performed. For example, depending on how one parenthesizes the expression $5-3\cdot 4+6$, one can obtain the following values (among others):

$$-25 = 5-(3\cdot(4+6))$$
$$-13 = 5-((3\cdot 4)+6)$$
$$14 = ((5-3)\cdot 4)+6.$$

   Given an unparenthesized expression of the form $v_1 \diamond_1 v_2 \diamond_2 v_3 \ldots \diamond_{n-1} v_n$, where $\diamond_i$ is a specified operation that is either $+$ or $\cdot$ and all operands (the v_i's) are positive, show how to find the parenthesization that maximizes the value of the expression.

2. Chapter 6, Problem 19
3. Chapter 6, Problem 25
4. Chapter 6, Problem 28
5. Chapter 7, Problem 3.