Analysis of Algorithms: Assignment 9

Due date: April 26 (Wednesday)

Problem 1 (3 points)
Suppose that you need to compute a product of five matrices, and their dimensions are $p[0..5] = \langle 3, 8, 5, 2, 20, 4 \rangle$. Give the optimal parenthesization of this product and the corresponding value of $m[0, 5]$.

Problem 2 (3 points)
Determine a longest common subsequence of $\langle a, b, a, b, a, a \rangle$ and $\langle b, a, a, b, b, a, a, b \rangle$. Using Figure 16.3 in the book as a model, draw the table constructed by the LCS-Length algorithm for these two sequences (you do *not* need to show arrows in your table).

Problem 3 (4 points)
Give pseudocode for a modified version of LCS-Length that uses only $O(n)$ memory; that is, your version should *not* use a matrix for storing intermediate values.

Problem 4
This problem is optional, and it allows you to get 2 bonus points toward your final grade for the course. You cannot submit this bonus problem after the deadline.

Consider two recurrences:

$$A_0 = 0$$
$$A_n = A_{n-1} + n \quad (\text{where } n \geq 1)$$

$$B_0 = 0$$
$$B_n = B_{n-1} + A_n \quad (\text{where } n \geq 1)$$

Give a *constant-time* algorithm Find-B(n) for computing B_n. Note that the running time should *not* depend on n, which means that the algorithm should have no loops.