

# CSCI 539 Algorithms

## Homework 6

Due: December 6, 2001

1. Show how to multiply two complex numbers  $x = a + bi$  and  $y = c + di$  using only three multiplications.
2. Given 0.42, 0.25, 0.27, 0.07, 0.72, 0.86, 0.09, 0.44, 0.50, 0.68, 0.73, 0.31, 0.78, 0.17, 0.79, 0.37, 0.73, 0.23, 0.30. Show the results of the following on-line bin packing algorithms on the above input.
  - (a) First-fit.
  - (b) Best-fit.
  - (c) Next-fit.
3. What is the optimal way to compute  $A_1A_2A_3A_4A_5A_6$ , where the dimensions of the matrices are:  $A_1 : 10 \times 20$ ,  $A_2 : 20 \times 1$ ,  $A_3 : 1 \times 40$ ,  $A_4 : 40 \times 5$ ,  $A_5 : 5 \times 30$ ,  $A_6 : 30 \times 15$ ? To answer the question, you must first use dynamic programming to build the  $6 \times 6$  table.
4. Show by counter examples that none of the following greedy algorithms for chained matrix multiplication works. At each step
  - (a) Compute the cheapest multiplication.
  - (b) Compute the most expensive multiplication.
  - (c) Compute the multiplication between the two matrices  $M_i$  and  $M_{i+1}$  such that the number of columns in  $M_i$  is minimized.