CSE 521: The Design and Analysis of Algorithms
Assignment #1
April 4, 1997
due: Friday, April 11

1. (a) Let m_c be the minimum number of multiplications to multiply two $c \times c$ matrices. (For instance, the "standard" method shows $m_2 \leq 8$, and Strassen showed $m_2 \leq 7$.) Determine the asymptotic complexity of $n \times n$ matrix multiplication, in terms of n, c, and m_c, which occurs if the matrices are decomposed into c^2 submatrices each of size $n/c \times n/c$, and the m_c-multiplication algorithm is used recursively.
   (b) Exercise 31.2-3 on page 744. (For your interest, Laderman has shown that $m_3 \leq 23$.)
   (c) Exercise 31.2-4 on page 744.
2. Exercise 31.2-6 on page 745. (Hint: It may help you to use the graphical method used on pages 741–743.)
3. Exercise 31.3-8 on page 749. (Hint: Consider the Boolean matrix A with entries

$$A_{ij} = \begin{cases} 1, & \text{if } i = j \text{ or } (i,j) \text{ is an edge} \\ 0, & \text{otherwise} \end{cases} .$$

   What is the (i,j) entry of A^t, where this tth power is computed via Boolean matrix multiplication?)