

CS 3500: Introduction to the Theory of Computation

Problem Set 5

Due July 8, 2003.

Problem 1 [20 Points]

Problem 7-4 on page 162 of CLRS.

Problem 2 [20 Points]

Problem 8-6 on page 180 of CLRS.

Problem 3 [20 Points]

Excercise 9.3-1 on page 192 of CLRS.

Problem 4 [20 Points]

Excercise 9.3-6 on page 192 of CLRS.

Problem 5 [20 Points]

Problem 5-2, parts (a) – (d), on page 118 of CLRS. For part (d), you may find the *coupon collector problem* on page 110 helpful.

Problem 6 [20 Points]

W. Strassen, a cousin of V. Strassen, claimed that he devised an ingenious algorithm for multiplying two 4×4 matrices using 32 multiplications and 3500 additions. Suppose W. Strassen's algorithm were correct. Using this algorithm, design an efficient divide-and-conquer algorithm for multiplying two $n \times n$ matrices for general n , and analyze the running time of your algorithm. Does this improve the $O(n^{\log_2 7})$ asymptotic running time of V. Strassen's algorithm? For simplicity in analysis you may assume that n is a power of 4.