BU CLA CS 530: Analysis of Algorithms
Spring 1995

Problem Set 5 (due Thursday 95.02.23)

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1. Exercise 22.2-3, page 446, in [CLR].

2. (a) Write the algorithm (in pseudo-code) for FIND-SET *without* path-compression when disjoint-set forests are used. (The version of FIND-SET appearing on page 449, in [CLR], is with path-compression.)
   (b) Exercise 22.3-3, page 450, in [CLR]. (*Hint*: Let $m = n + p + q$ where n is the number of MAKE-SET op's, p the number of UNION op's, and q the number of FIND-SET op's. Choose $n = p = q$ and show there is a sequence of op's whose running time is at least $\Omega(m \ \log \ n)$ which is also, by the choice of n, p, and q here, $\Omega(n \ \log \ n)$.)
   (c) Exercise 22.4-3, page 458, in [CLR]. (*Hint*: It is perhaps easier to solve it directly, based on what you know from Section 22.3, i.e. you don't really need to use Lemma 22.2 and Corollary 22.5.)

The two next exercises are about counting and probability. They are intended as review material.

3. Exercise 6.6-1, page 132, in [CLR].

4. A room contains 30 randomly chosen people. Show that the probability that at least 2 of them share the same birthday exceeds 1/2. Ignore the issue of leap years and assume that all years have $n = 365$ days. (*Hint*: There is a two-page formal proof in Section 6.6 of [CLR]. You will not get credit by referring to this section. Start fresh from first principles. There is a simple rigorous argument not exceeding 10 lines.)

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