CS 373: Combinatorial Algorithms, Summer IMCS 2000

`http://www-courses.cs.uiuc.edu/~cs373`

Homework 6 (due Tue Aug 8, 2000)

To submit solutions, *attach* a *postscript* file to an email sent to maharri@cs.uiuc.edu with the subject *cs373hw submit*. You will then get an automatic acknowledgment.

1. (5 pts) One of the first nontrivial reductions given is that from SAT to 3-CNF-SAT. Give the reduction in the other direction and, more importantly, explain what this latter reduction says about the two problems.

2. (5 pts) Show that the problem of determining whether a boolean formula is a tautology is complete for coNP. Hint: first show that if a problem is NP-complete, then the complement of the problem is coNP-complete.

3. (5 pts) The *longest-simple-cycle* problem is the problem of finding a simple cycle of maximum length in a graph. Convert this to a formal definition of a decision problem and show that it is NP-complete.

4. (5 pts) Notice that, on the first midterm exam, you gave an $O(nK)$-time dynamic programming algorithm for the Knapsack problem. Yet the problem is NP-complete. Explain this apparent conflict. Hint: how do we measure running time?