

COMS W3261: Theoretical Computer Science.

Instructor: Tal Malkin

Problem Set 12

Due: Wed, 05/06/09

(Drop at Prof. Malkin's office, or under the door).

No late homework will be accepted.

Reading: 7.1-7.4

1. 7.8 in text (prove that CONNECTED is in P, by analyzing a given algorithm).
2. 7.11 in text (ISO is in NP).
As a side note, we do not know whether ISO is in P, nor whether ISO is NP-Complete. It is often believed that it is neither, namely that ISO is a hard problem (not in P), but not "the hardest problem" (not NP-Complete).¹
3. Read problem 7.29 in text (a scheduling problem for final exams). Formulate this problem as a language, and show that this language is in NP. (That is, solve problem 7.29, except you don't have to show that the problem is NP-hard, just that it is in NP).
4. (a) Show that P is closed under complement.
(b) Show that NP is closed under concatenation.
5. Let L be some non-trivial language that is in P (e.g., L =CONNECTED, L =COMPOSITES, $L = a^*$, etc). Prove that L is NP-Complete if and only if $P=NP$.

¹Of course, if $P=NP$, this belief is wrong on both counts.