

Problem Set 11

Due: Never

Reading: Chapter 7.1-7.4

1. Problems 7.6 and 7.7 in text (closure of P and NP under various operations).

As a side note, P and NP are both also closed under the star and the intersection operations (e.g., see problem 7.15 in text). We currently do not know whether NP is closed under complement.

2. Problem 7.8 in text (prove that CONNECTED is in P, by analyzing a given algorithm).
3. Let L be some non-trivial language in P (e.g., $L = \text{CONNECTED}$, $L = \text{COMPOSITES}$, $L = a^*$, etc).

Prove that L is NP-Complete if and only if $P=NP$.

4. Read problem 7.29 in the 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).
5. Problem 7.11 in book (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 an NP-Complete problem).¹

¹Of course, if $P=NP$, this is wrong on both counts, as per problem 3 above.