Institut for Matematik og Datalogi
Syddansk Universitet

April 7, 2016
JFB

DM553 – Complexity and Computability – 2016
Lecture 12

Lecture, March 29

First we showed that 3-SAT is NP-Complete. To do this, we assumed that CNF-SAT is NP-Complete. The proof that 3-SAT is NP-Complete combines the proofs in both the Sipser and the CLRS books. Then, we covered the proof that SATISFIABILITY is NP-Complete, from section 7.4 in Sipser's textbook.

Lecture, April 11

We will show that CNF-SAT, CLIQUE, VERTEX COVER, INDEPENDENT SET, and SUBSET SUM are NP-Complete. See chapter 34 in CLRS.

Lecture, April 14

We will show that HAMILTONIAN CIRCUIT is NP-Complete. Then we will start on lower bounds from section 2.4 in the notes. (Part of this is also in section 8.1 of CLRS.)

Problems to be discussed in U14 on April 19

1. In the CLRS textbook, do the following:

   - - 34.5-1. Two graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ are isomorphic if there exists a bijection (a function that is 1-1 and onto) $f : V_1 \to V_2$ such that for all $v_i, v_j \in V_1$, $(v_i, v_j) \in E_1$ if and only if $(f(v_i), f(v_j)) \in E_2$. The function f is called an isomorphism.
     - Now assume that you have a polynomial-time algorithm for solving the subgraph-isomorphism problem. Descripe how to use this algorithm to find an isomorphism from the first graph to a subgraph of the second.
   - 34.5-2 – try a reduction from Vertex Cover, too.
   - 34.5-4. (you may check on pages 1128–1129 for a hint)
   - 34.5-5 (Warning: it is tempting to think that this one is completely trivial; it is not. Also, to make this easier, you may redefine the Set Partition problem to allow the same value appearing more than once.)
   - 34-2.

Study group suggestion

Try preparing a presentation of the proof that SATISFIABILITY is NP-Complete, using the proof in the Sipser textbook.