Computational Complexity

Exercise Session 2

Exercise 1. Show that NP $\subseteq$ EXP.

Exercise 2. Consider the following problem Reverse-3SAT:

> **Instance:** A propositional formula φ in 3CNF—that is, a formula of the form $\varphi = c_1 \wedge \cdots \wedge c_m$, where each c_i is of the form $c_i = l_{i,1} \vee l_{i,2} \vee l_{i,3}$, where $l_{i,1}, l_{i,2}, l_{i,3}$ are propositional literals.
>
> **Question:** Is there a truth assignment α to the variables occurring in φ that sets at least one literal in each clause c_i to **false**?

Prove that Reverse-3SAT is NP-complete—that is, prove that is in NP and that it is NP-hard. To show NP-hardness, you may give a reduction from any known NP-complete problem.

- *Hint:* reduce from 3SAT.

Exercise 3. Give a polynomial-time Turing machine $\mathbb{M}$ that has access to an oracle for Reverse-3SAT and that solves 3SAT.