Revision: Week 13   Due on Nov 18, 2024.

① Prove the two claims from the notes of Lecture 27.   [4+ 4]

② Define CoNP = { L : the complement of L is in NP }.

Why is the following not a correct proof of coNP ⊆ NP ?

Let L ∈ coNP. Then there is an efficient non-deterministic TM N that decides the complement of L. Define another non-deterministic TM as follows.

N': On input w,

1. Run N on w.
2. If it accepts, reject and if it rejects, accept.

Since N is efficient, so is N'.

Therefore L ⊆ coNP.

[3]

(3) A subset of nodes of a graph G is a dominating set if every other node of G is adjacent to some node in the subset.

Let

$$DOMINATING-SET = \left\{ \langle G, k \rangle \mid \begin{array}{l} G \text{ has a} \\ \text{dominating} \\ \text{set of size } k. \end{array} \right\}$$

Show that this is NP-Complete.   [4]

[Hint: Recall that VERTEX-COVER is
                              NP-Complete]

(4) Given a CNF formula ϕ with n variables and c clauses, construct an NFA with $O(cn)$ states that accepts all non-satisfying assignments represented as Boolean strings of length n [5].