Introduction to Theoretical Computer Science

Tutorial Sheet 5

The following questions/comments are intended as prompts for discussion. Of course, you can ask/discuss about anything. Some of these topics we’ve touched on in discussion in lectures – this is an opportunity to think about them a bit more.

(1) VERTEX-COVER: given a graph, a vertex cover is a subset of vertices such that every edge has at least one end in the cover. VERTEX-COVER is, given a graph $G$ and an integer $k$, does $G$ have a vertex cover of size $k$?

Give reductions from CLIQUE to VERTEX-COVER, and the other way round. (Hint: complementary graph.)

(2) I said the following were obvious:
   - $\text{PSPACE} \supseteq \text{PTime}$
   - $\text{PSPACE} \supseteq \text{NPTime}$
   - $\text{PSPACE} \subseteq \text{ExpTime}$

Discuss why they’re obvious!

(3) $\text{P}^{\text{NP}}$ obviously includes all of NP and co-NP. So how does $\text{NP}^{\text{NP}}$ differ from it – what else is there? (Assuming, that is, that $\text{P} \neq \text{NP}$.)