

Homework 1

Due: April 11, 2018

1. The definition of 3SAT allows for clauses to have fewer than three literals. We will define a restricted version of 3SAT called EXACT-3SAT in which the literals in each clause must be distinct and every clause must have exactly three literals. (Recall that a *literal* is a variable or the negation of a variable). Prove that 3SAT reduces to EXACT-3SAT.
2. Prove that there exist functions which are not proper.
3. A complexity class \mathcal{C} is said to be *closed under reductions* if whenever L reduces to L' and $L' \in \mathcal{C}$, then $L \in \mathcal{C}$. Prove that \mathbf{P} and \mathbf{PSPACE} are closed under reductions. Is $\mathbf{TIME}(n^2)$ closed under reductions? Justify your answer.
4. Show that one of the following inequalities must hold: $\mathbf{L} \neq \mathbf{P}$ or $\mathbf{PSPACE} \neq \mathbf{P}$. Note that both are believed to be true, and no one knows how to prove either one.