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Modern Complexity Theory

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Assignment 6

Problem 17 (3 points)**:**
Prove that NP is exactly equal to the set of all languages L for which there exists a polynomial time recognizable relation R_L such that

$$L = \{x : \exists y \, (x, y) \in R_L\}$$

and $(x, y) \in R_L$ only if $|y| \leq poly(|x|)$.

Problem 18 (4 points)**:**
Modify the proof of IP $\subseteq PSPACE$ for the case that private coins are used by the verifier.
Hints: If the verifier uses private coins, we can assume without loss of generality that he chooses all of these coins before starting any interaction with the prover. Give a recursive formula that allows to calculate the best possible acceptance probability for the verifier in this case, and show that it can be evaluated in polynomial space.

Problem 19 (3 points)**:**
Give a rigorous proof of Theorem 6.7.