

EECS 395-23 – Assignment 5

1. Show that if $P = NP$ then there is some polynomial-time computable function f such that for all satisfiable formula ϕ , $f(\phi)$ is a satisfying assignment of ϕ .

Hint: Consider the language

$$L = \{ (\phi, a_1 \dots a_k) \mid \text{There is a satisfying assignment of } \phi \text{ beginning with } a_1 \dots a_k \}.$$

2. Use the above proof to show that if $NP \subseteq BPP$ then $NP = RP$.
3. Prove that $ZPP = RP \cap \text{co-RP}$. Hint: Use Markov's inequality.
4. Use the proof that $BPP \subseteq \Sigma_2^p$ to show the following:
 - (a) $BPP \subseteq ZPP^{NP}$.
 - (b) $MA \subseteq \Sigma_2^p$.
 - (c) $AM \subseteq \Pi_2^p$.