Problem Set 6

CSE 531 - Computational Complexity

Winter 2024

Exercise 6.3 (from the book of Arora and Barak; 10pts)
Prove that there is a decidable language in $\mathbf{P}/\mathbf{poly}$ that is not in $\mathbf{P}$.
Hint. Prove that there is a unary language that is not in $\mathbf{P}$. Make use of the Deterministic Time Hierarchy Theorem.

Exercise 6.7 (Upper bounds can imply lower bounds; from the book of Arora and Barak; 10pts)
Prove that for some constant $C > 0$ the following holds: If $\mathbf{NP} = \mathbf{P}$ then there is a language $L \in \mathbf{EXP}$ so that $L \notin \mathbf{SIZE}(C \cdot 2^n/n)$.
Hint. A proof strategy similar to Kannan's Theorem works.