

General Instructions: Same as in Homework 1.

Honor Principle: Same as in Homework 1.

6. Is $\text{DTIME}(2^n) = \text{DTIME}(2^{0.9n})$? You can answer “yes,” “no,” or “I think this is an open question.” Give clear reasons! Prove that there is a constant $\alpha < 1$ such that $3\text{SAT} \in \text{DTIME}(2^{\alpha n})$. [2 points]

7. Consider the language

$$\text{ALL}_{\text{NFA}} = \{ \langle M \rangle : M \text{ is a nondeterministic finite automaton over } \Sigma \text{ such that } \mathcal{L}(M) = \Sigma^* \}.$$

Note that the alphabet Σ is specified as part of the encoding $\langle M \rangle$. Prove that ALL_{NFA} is PSPACE-complete.

Hint: While reducing from TQBF may be tempting as an approach, it may be a better idea to carefully study the proof of [Sipser, Theorem 5.13] and try to adapt that. [2 points]