

Problem Set 9

Due: Tue, 11/20/07

Note: This homework is shorter than usual, and will only count as **half** a homeork

Reading: Chapter 4

1. Let $L = \{\langle N \rangle \mid N \text{ is an NFA such that all strings accepted by } N \text{ have } 000 \text{ as a substring}\}$.

Prove that L is decidable.¹

2. Let $NE = \{\langle M \rangle \mid M \text{ is a TM that accepts some string}\}$ (namely all $\langle M \rangle$ that recognize a non-empty language).

Prove that NE is Turing-recognizable. (Hint: Construct a TM/algorithm that recognizes NE . Make sure that any $\langle M \rangle \in NE$ will indeed be accepted by your TM after a finite number of steps).

3. Let A be a countable set. Prove that $\{B \mid B \subseteq A\}$ is not countable, using the diagonalization method.

¹To see some examples, check the solved problems in the textbook Chapter 4.