COMP 272 Theory of Computation
Spring Semester 1997
Homework 1

As previously stated, the solutions to these problems can be submitted to the TAs but are not required to be. These problems should be handed in at the tutorial on Thursday, February 20. Late submissions will not be marked (this is because the TAs will try to review the solutions to problems on the day they are due and we would rather you submit the problems before receiving the solutions).

---

1. Problem 1.2.1 in Lewis and Papadimitriou.
2. Let $\mathcal{N} = \{0, 1\,2\,\ldots\}$ be the set of whole numbers and $\mathcal{Z} = \{-2, -1\,0, 1\,2\,\ldots\}$ be the set of all integers.
   (a) Give a bijection between $\mathcal{N}$ to $\mathcal{Z}$.
   (b) Give a bijection between $\mathcal{N}$ to $\mathcal{Z} \times \mathcal{Z}$.
3. Prove each of the following statements using the inductive definition of *reversal* given in the slides:
   (a) $\left(w^R\right)^R = w$ for any string w.
   (b) $(w^i)^R = (w^R)^i$ for any string w and any $i \geq 0$.
4. Prove
   (a) $\{e\}^* = \{e\}$
   (b) for any alphabet Σ and any language $L \subseteq \Sigma^*$, $(L^*)^* = L^*$.
5. Problem 1.9.2 in Lewis and Papadimitriou.
6. Let $\Sigma = \{a, b\}$. Write regular expressions representing the following sets:
   (a) All strings in Σ^* with exactly one or two a-s (but not 0 a-s. or more than two a-s).
   (b) All strings in Σ^* with number of a-s divisible by 3.
   (c) All strings in Σ^* with exactly one occurrence of abb.