

# Introduction to the Theory of Computation

## Homework #4

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1 Sipser: 1.15

- (a) The states of  $N$  are the states of  $N_1$ .
- (b) The start state of  $N$  is the same as the start state of  $N_1$ .
- (c)  $F = \{q\} \cup F$ . The accept states  $F$  are the old accept states plus its start state.
- (d) Define  $\delta$  so that for any  $q \in Q$  and any  $a \in E$ ,

2

3 Proof: By Structural Induction

- Observe  $x \in \Sigma^*, L = L(R)$

- Assume  $R$  is over  $\Sigma$

$$x \in \Sigma^*$$

$$L(R) = x$$

□

4

- (a) False,  $a, b^*$  is regular, but it contains a non-regular subset  $\{a^n b^n | n \geq 0\}$
- (b) False, Non-regular languages have finite subsets, and finite languages are regular.
- (c) False, the union of a language and its complement is  $\Sigma^*$  which is regular.
- (d) False, A non-regular languages intersected with its complement is empty, which is regular.
- (e) False,  $L_2$  could just be a subset of  $L_1$ .