

CSE 322: Introduction to Formal Models in Computer Science  
Assignment #3  
October 19, 2005  
due: Wednesday, October 26

1. Prove the rest of the correctness of the construction in Theorem 1.47 [1st Ed: Theorem 1.23]. That is, you should prove that, if  $w \in L(N_1) \circ L(N_2)$ , then  $w \in L(N)$  .
2. Let  $L$  be the language accepted by the NFA of Example 1.33 [1st Ed: Example 1.15] on page 52. Use the construction given in the proof of Theorem 1.49 [1st Ed: Theorem 1.24] to give the state diagram of an NFA recognizing the language  $L^*$ .
3. Exercise 1.15 [1st Ed: Exercise 1.11]. As part of your counterexample you must supply a string that proves that  $L(N) \neq (L(N_1))^*$ .
4. Use the procedure described in Lemma 1.55 [1st Ed: Lemma 1.29] to convert the regular expression

$$((\varepsilon \cup 1) \cup 00^*1)^*$$

into the state diagram of an NFA. Do not skip steps or simplify your automaton. That is, everyone who follows the procedure correctly should come up with the exact same diagram.

5. Use the procedure described in Lemma 1.60 [1st Ed: Lemma 1.32] to convert the NFA of Figure 1.36 [1st Ed: Figure 1.20] on page 53 to an equivalent regular expression. Eliminate the states in the order  $q_3, q_2, q_1$ . Do not skip steps or simplify your regular expressions. That is, everyone who follows the procedure correctly should come up with the exact same regular expression.