Computer Science 81, Fall 2006
Assignment 2
Due Thur. Sept. 14
Finite-State Automata and Their Limitations

Solve the following problems in conjunction with reading Kozen lectures 6-12 (pages 33-76):

1. Kozen mentions that NFA's with ε-transitions do not provide any additional power over NFA's without ε-transitions. Re-formalize the definition of Δ-hat in Lecture 6 to accommodate ε–transitions. Make any necessary modifications to the remainder of the proof that for any NFA with ε-transitions there is a DFA accepting the same language.

2. Show that the reversal of a regular language is regular using structural induction on the definition of regular expressions.

3. For any language L, lastHalves(L) = $\{y \mid \exists x\ xy \in L \text{ and } |x| = |y|\}$. Show that if L is regular, then so is lastHalves(L).

4. For any language L, define square(L) = $\{xx \mid x \in L\}$. Is square(L) regular for every regular language L? Prove your answer.

5. For any language L, define sqrt(L) = $\{x \mid xx \in L\}$. Is sqrt(L) regular for every regular language L? Justify your answer.