Problem Set 4 — Due April 29, 2004

Problem 1. Consider applying the product construction to NFAs $M_1 = (Q_1, \Sigma, \delta_1, q_1, F_1)$ and $M_2 = (Q_2, \Sigma, \delta_2, q_2, F_2)$ in order to show that the NFA-acceptable languages are closed under symmetric difference.

Part A. Formally specify the product machine $M = (Q, \Sigma, \delta, q_0, F)$.

Part B. Does the construction work—that is, is $L(M) = L(M_1) \oplus L(M_2)$?

Problem 2. Let α and β be regular expressions. Prove that there exists a number N, algorithmically computable given α and β, such that $L(\alpha) = L(\beta)$ whenever $L(\alpha) \cap \{\mathtt{0}, \mathtt{1}\}^{\leq N} = L(\beta) \cap \{\mathtt{0}, \mathtt{1}\}^{\leq N}$.

Problem 3. Page 86, Exercise 1.17, parts b and c.

Problem 4. Page 88, Problem 1.23, parts a and d.