Problem Set 3 — Due Wednesday, January 28, 1998

Problem 1. Page 86, Exercise 1.14, part (b).

Problem 2. Page 86, Exercise 1.16, part (b).

Problem 3. Page 90, Problem 1.41.

Problem 4. Define the reversal operator, ^{R}, by $(a_1 a_2 \cdots a_n)^R = a_n a_{n-1} \cdots a_1$, and $\varepsilon^R = \varepsilon$. Lift this to be an operator on languages by defining $L^R = \{x^R : x \in L\}$. Prove or disprove: the regular langages are closed under reversal.

Problem 5. Use the pumping lemma to show that the following languages are not regular.

(a) $L_a = \{0^m 1^n 0^{m+n} : m, n \geq 0\}$.

(b) $L_b = \{0^{2^n} : n \geq 0\}$.

Problem 6. Page 90, Problem 1.42. (*Note — This problem is challenging! I would expect only a handful of people to solve this.*)