

## Problem Set 6 — Due February 22, 2005

**Problem 1** Prove that the context free languages are closed under reversal.

**Problem 2.** A *right-linear grammar* is a CFG in which every rule is of the form  $A \rightarrow aB$  or  $A \rightarrow \varepsilon$  (where  $a$  is a terminal and  $B$  is a variable).

**Part 2.1.** Prove that every regular language is accepted by a right-linear grammar.

**Part 2.2.** Prove that every right-linear grammar generates a regular language.

**Problem 3** Building on Problem 2, define what you think a *left-linear grammar* ought to be, and then state and prove a theorem about these objects.

**Problem 4** Prove that the following two languages are not context free.

4.1.  $L = \{a^i b^j c^k : j = \max\{i, k\}\}$

4.2.  $L = \{b_i \# b_{i+1} : b_i \text{ is } i \text{ in binary, } i \geq 1\}$

**Problem 5.** Page 122, Problem 2.26.