Problem Set 6 – Due Tuesday, May 11, 2010, at 4:15 pm

Problem 1. If A and B are languages define $A \diamondsuit B = \{xy | x \in A \text{ and } y \in B \text{ and } |x| = |y|\}$.

a. Show that if A and B are regular then $A \diamondsuit B$ might not be regular.

b. Show that if A and B are regular then $A \diamondsuit B$ is context free.

Problem 2. Let α be a regular expression. Describe an efficient (polynomial-time) procedure to convert α into a CFG G such that $L(G) = L(\alpha)$. Give the grammar corresponding to $(a \cup bab)^*$ under your construction.

Problem 3 You are given a CFG $G = (V, \Sigma, R, S)$. Describe an efficient procedure to decide if $L(G) = \emptyset$.