Math 220: Exam 1

Due Oct 11th 11:59pm

October 11, 2011

1 Rules

You may use your notes and the textbook, but may not use JFLAP. Show all your work for full credit
1.1 Minimize DFA

Find the minimum DFA equivalent to the NFA in Figure 1.1.
1.2 DFA → RE

Convert the DFA in Figure 1.2 into a regular expression following the algorithm discussed in class.
1.3 Planarity

Prove that every regular language is accepted by a planar NFA. An NFA is planar if it can be embedded in the plane such that there are no crossings
1.4 RE → LRG

Convert the regular expression 00(1 + 00)* into an NFA, then convert this NFA into a left linear grammar.
1.5 Closure

The shuffle of two languages $L_1$ and $L_2$ is defined as

$$\text{shuffle}(L_1, L_2) = \{w_1v_1w_2v_2\cdots w_mv_m : w_1w_2\cdots w_m \in L_1, v_1v_2\cdots v_m \in L_2, \forall w_i, v_i \in \Sigma^*\}$$

Show that the family of regular languages is closed under the shuffle operation.