

Math 220: Exam 1

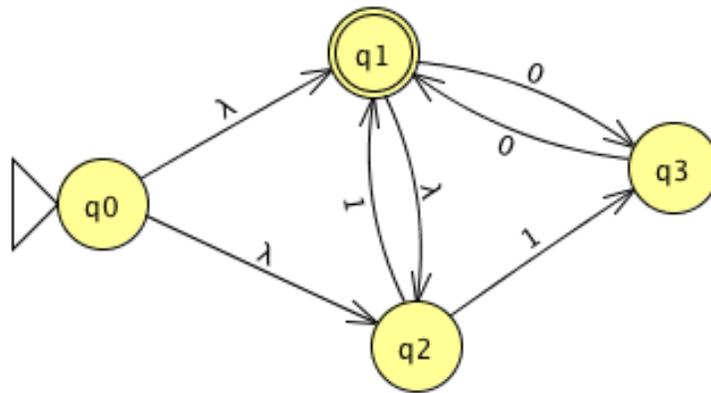
Due Oct 11th 11:59pm

October 11, 2011

1 Rules

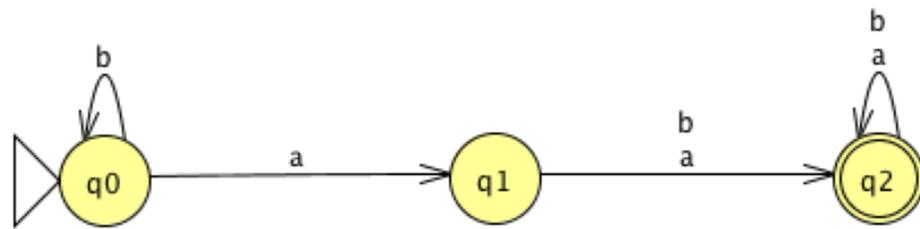
You may use your notes and the textbook, but may not use JFLAP. **Show all your work for full credit**

1.1 Minimize DFA



Find the minimum DFA equivalent to the NFA in Figure 1.1.

1.2 DFA \rightarrow 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 \rightarrow 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

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

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