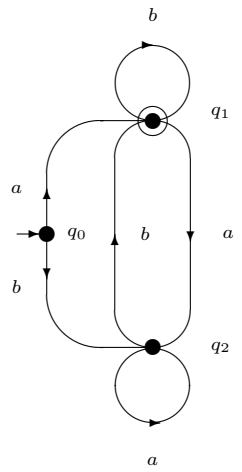

Figure 1: Graph of the Deterministic Finite Automaton $\mathcal{M}$

Homework 2

Due Monday, November 5, 2012

1. Consider the dfa $\mathcal{M} = (\{a, b\}, \{q_0, q_1, q_2\}, \delta, q_0, \{q_1\})$ whose graph is given in Figure 1. Determine the language accepted by the automaton $\mathcal{M}$.

2. Construct deterministic finite automata that accept the following languages over the alphabet $A = \{a, b, c\}$:

   (a) The set of all words that begin with ab and end with ba.

   (b) The set $\{bab\}$.

   (c) The set $A^* - \{bab\}$.

   (d) The set of all words $x \in A^*$ that contain at least three as.

3. Each of these languages is a regular language over the alphabet $A = \{0, 1\}$. Draw the transition diagram of a deterministic finite automaton that accepts it.

   (a) A^*.

   (b) $\{\lambda\}$.

   (c) $\emptyset$.

4. Let A be an alphabet. If b is a symbol such that $b \notin A$, construct a nondeterministic finite automaton that accepts the language A^*b.

5. Let L, K be two regular languages on an alphabet A. Prove that the set of words $t \in A^*$ that can be written as

$$t = xy^R = u^R z$$

for some $x, u \in L$ and $y, z \in K$ is a regular language.