Discrete Mathematics
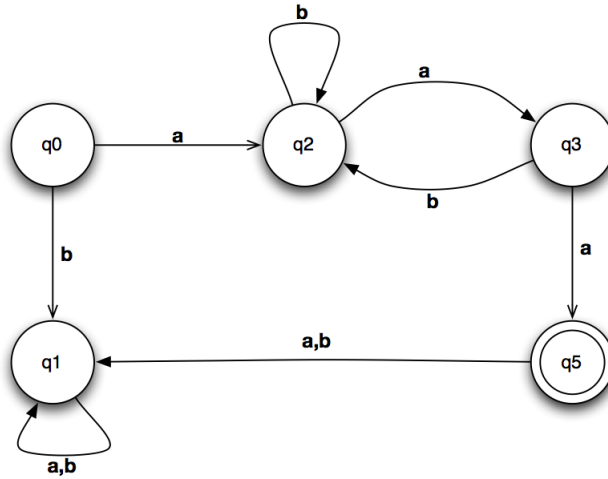Carsten Schürmann
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Homework 8

due *before* class meets.

1. Define languages for the following sets of regular expressions:

   (a) $\mathcal{L}(1 + 1 \times 0)$

   (b) $\mathcal{L}(0 \times 1^*)$

   (c) $\mathcal{L}((0 \times 1)^*)$

   (d) $\mathcal{L}(1 \times (0 + 1)^*)$

   Note: Recall that the language is defined as a set of strings.

2. Give a regular expression that accepts the same language as recognized by the following deterministic finite automaton. Prove your claim.

   Hint: Guess the regular expression and translate it back into an automaton and manipulate the automaton until it matches the one above.

3. Give a deterministic finite automaton that accepts

$$\mathcal{L}((0 + 1 \times 1)^* 1)$$

4. Define an automaton that accepts $\mathcal{L}(((a \times b + c) + a^*)^*)$.

5. Prove the following:

$$\mathcal{L}(R^*) = \mathcal{L}(1 + R \times R^*)$$

   Recall that $\mathcal{L}(R^*) = \{s_1 \ldots s_n | \forall i.s_i \in \mathcal{L}(R)\}$