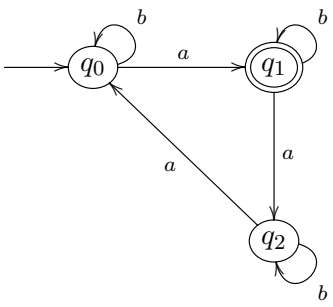
COMP4141 Homework 2

Due date: Wed Mar 6, 2019, 14:05

Homework may be submitted solo or in groups of at most two. Submit homework *legibly handwritten in ink*. Use block letters if your cursive writing is not sufficiently legible.

Exercise 1 Suppose that you are given two *deterministic* finite state automata M_1, M_2, with n_1, n_2 states, respectively. Show that there exists a *deterministic* finite state automaton M with $n_1 \times n_2$ states such that $L(M) = L(M_1) \setminus L(M_2)$, i.e., $L(M)$ is the set of words in $L(M_1)$ but not in $L(M_2)$.

Exercise 2 Consider the following DFA in graphical representation:



Using the construction from lectures/Sipser, convert this to a regular expression that accepts the same language. Delete states in the order q_2, q_1, q_0, and show your working.

Exercise 3 Prove that the following language is not regular: $\{w \in \Sigma^* \mid |w| = n^2 \text{ for some } n \in \mathbb{N}\}$, where $\Sigma = \{0, 1\}$.