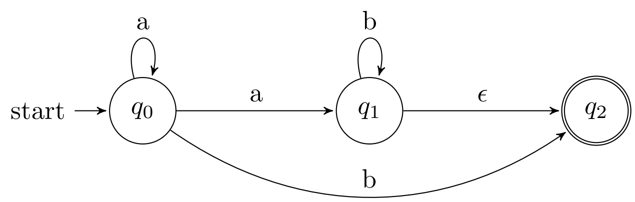
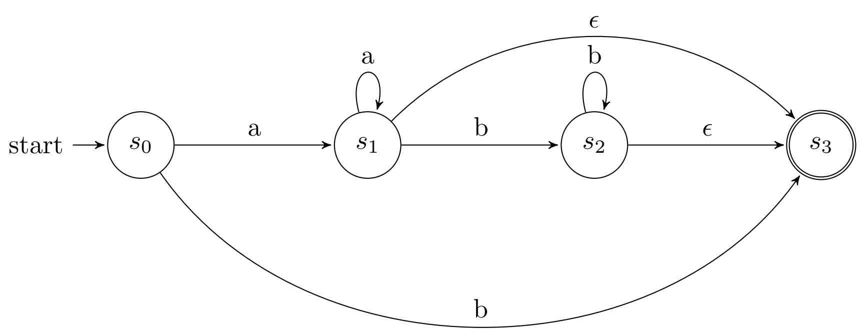
Assignment 4 by Lucas Karlsson

1. Prove that $a^*(b + ab^*) = b + aa^*b^*$.

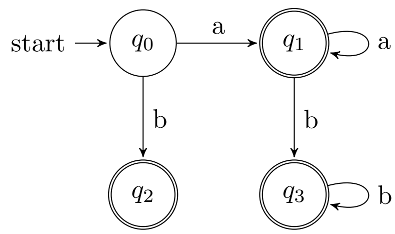
Solution 1:
I read online about an algorithm to determine whether two RE are equal, one could construct NFA's from both and then using these convert them into DFA's using subset construction and then minimize these using a standard dfa minimization algorithm. And then compare these to see if they accpets the same language.

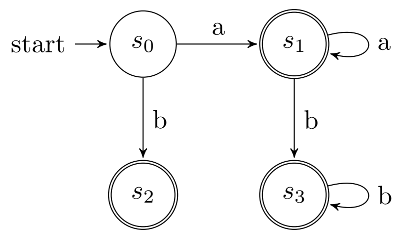
Step 1. Turning them into NFA's where $\mathbf{Q} = a^*(b + ab^*)$ and $\mathbf{S} = b + aa^*b^*$





Step 2. Now we can turn these NFA's into DFA's by removing the epsilon transitions and making the states that had a epsilon transition into a accepting state a accepting state instead, doing this for **Q** and **S** will give us the result below. **Q**





Step 3. Well we can now see that the automatas are identical and will accept the same language and then by definition is equal to eachother.

2. Prove that every non regular language over an alphabet Σ has an infinite complement (with respect to Σ^*)

Solution 2:
asd

3. Show that the language $\{w \in \{0,1,2\}^* \mid \#_0(w) + \#_1(w) = \#_2(w)\}$ over the alphabet $\{0,1,2\}$ is not regular by using the pumping lemma for regular languages. Here $\#_a(w)$ is the number of occurences of a in w.

Solution 3:
asd

4. Minimize the following DFA: (Do not just give the answer do a step by step)

Solution 4:

			0	1
→	*	s_0	s_1	s_3
		s_1	s_4	s_2
	*	s_2	s_1	s_5
		s_3	s_0	s_4
		s_4	s_4	s_4
		s_5	s_2	s_4