Quiz 2 Solutions

Problem 1. True or False (no justification needed):

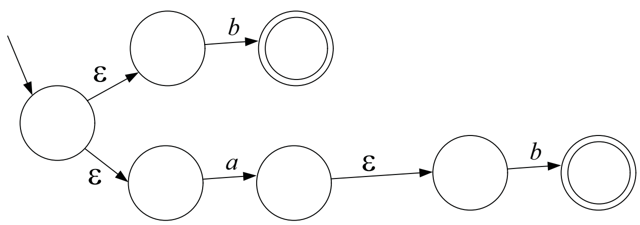
A. There is a regular expression for the language $(a \cup ab)^* \cap \mathit{noprefix}(b^*c)$ where *noprefix* was defined in problem set 3. *True*

B. The DFA-acceptable languages are closed under complement, but the NFA-acceptable languages are not. *False*

C. A subset of a regular language is necessarily regular. *False*

D. Every finite language is regular. *True*

Problem 2. Using the procedure seen in class, convert the regular expression $(ab \cup b)$ into an NFA. Don't "simplify" the machine.



Problem 3. By the conventions of your text and lecture, an **NFA** is a 5-tuple $M = (Q, \Sigma, \delta, q_0, F)$ where function δ maps $\boxed{Q \times (\Sigma \cup \{\varepsilon\})}$ to $\boxed{\mathcal{P}(\mathcal{Q})}$.

Problem 4 What is the **product construction** and what is it used to show?

Given DFAs $M_1 = (Q_1, \Sigma, \delta_1, q_1, F_1)$ *and* $M_2 = (Q_2, \Sigma, \delta_2, q_2, F_2)$ *we construct a new DFA* $M = (Q, \Sigma, \delta, q, F)$ *where* $Q = Q_1 \times Q_2$ *and* $\delta((q', q''), a) = (\delta_1(q', a), \delta_2(q'', a))$. *The construction is used to show that the DFA-acceptable languages (the regular languages) are closed under union, intersection, and other such operations.*