Quiz 4

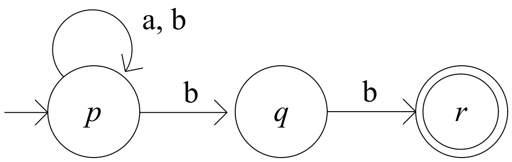
Firstname Lastname: ______________________ **ID#** ______________ **Seat#** ___

– *Don't sit next to anyone you know.*
– *Don't turn over this paper until you are asked to.*
– *When you finish, put this side up once again.*
– *Most or all problems will be graded all-or-northing.*
– *Relax, these quizzes are too insignificant to get stressed over.*

Happy Friday!

phil rogaway

(1) Write a **regular expression** for the language of the following NFA M_1. Make it as simple as possible. Use standard abbreviations, not writing the concatenation symbol or extra parentheses.



(2) Suppose L is accepted by a 10-state **DFA** M_2. Using constructions described in class, we could convert M_2 into a ______ -state **NFA** M_2' for $L\overline{L}$ (the bar denoting the complement of the language). We could then convert M_2' into a ______ -state **DFA** for $L\overline{L}$.

(3) Darken the box to indicate if the statement is True or False. Really make your mark **dark**. *As always, a statement is True if it is always true; otherwise it is False.*

True False Every regular language can be accepted by a DFA with an odd number of states.

True False Every regular language can be accepted by a DFA whose start state is never visited twice.

(4) Same instructions. Throughout, fix an NFA $M = (Q, \Sigma, \delta, q_0, F)$.

True False Suppose there is a $q_0 \rightsquigarrow q$ path in the diagram for M where $q \in F$ and the concatenation of edge-labels along the path is s. Then M accepts s.

True False Suppose there is a $q_0 \rightsquigarrow q$ path in the diagram for M where $q \notin F$ and the concatenation of edge-labels along the path is s. Then M rejects s.

(5) Let's begin a proof that $L = \{a^n b^n : n \geq 0\}$ is **not** regular:

Assume for contradiction that L is regular. Then there is a DFA $M = (Q, \Sigma, \delta, q_0, F)$ that accepts L. Let $N = |Q|$. Consider the $N+1$ strings ______ . Each of these strings w determines a state $\delta^*(q_0, w)$. By the pigeonhole principle (PHP), we know that some two of these states ______ . *And so on ...*

Make sure that whatever you write gives grammatical English.