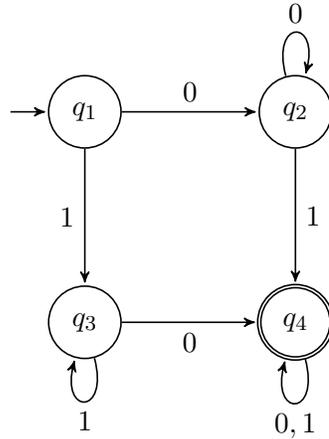
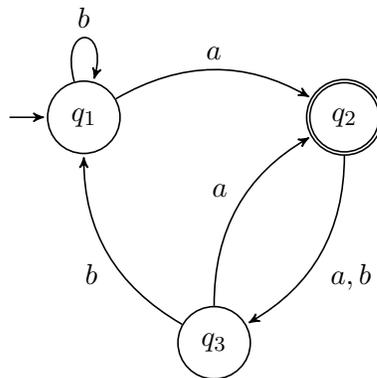


Directions: You may work to solve these problems in groups, but all written work must be your own. **Show your work;** See “Guidelines and advice” on the course webpage for more information.

1. Let $\Sigma = \{0, 1\}$ and let M be the automaton pictured below.



- (a) List the sequence of states of M on input 1101. Is $1101 \in L(M)$?
- (b) Give an English description for $L(M)$.
2. Let $\Sigma = \{a, b\}$. For each language A below, construct an automaton M that recognizes it.
- (a) $\{w \mid w \text{ has at most 1 } b\}$.
- (b) $\{w \mid \text{the number of } a\text{'s in } w \text{ is divisible by 3}\}$
- (c) $\{w \mid w \text{ has at most 1 } b \text{ and the number of } a\text{'s is divisible by 3}\}$.
3. Let $\Sigma = \{a, b\}$ and let M be the automaton pictured below (from Sipser 1.1).



- (a) Give a simple English description for $L(M)$.
- (b) Two automatas are *equivalent* if their languages are equal. The automaton above has 3 states but is equivalent to an automaton with only 2 states. Construct an automaton with 2 states that is equivalent to M .