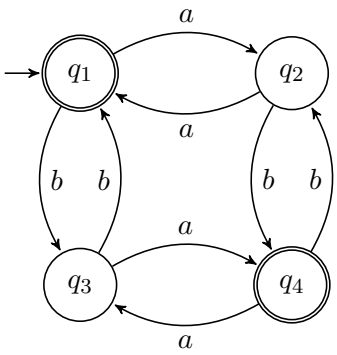
Name: _____

Directions: Show all work. No credit for answers without work.

1. Let $\Sigma = \{a, b\}$, and let M be the following automaton.



(a) **[1 point]** List the sequence of states of M on the string w, where $w = abbaa$. Is $w \in L(M)$?

(b) **[2 points]** Give a simple description for $L(M)$.

(c) **[1 point]** Construct a machine M' with the property that $L(M') = \overline{L(M)}$.

2. **[3 parts, 2 points each]** Let $\Sigma = \{a, b\}$. Construct (deterministic) finite automatons for the following languages over Σ.

   (a) $\{w \in \Sigma^* : w \text{ has at least two } b\text{'s}\}$

   (b) $\{w \in \Sigma^* : w \text{ has at most one } a\}$

   (c) $\{w \in \Sigma^* : w \text{ has at least two } b\text{'s and at most one } a\}$