1. Let $M$ be a DFA with states $q_1$, $q_2$, and $q_3$, where $q_1$ is the start state and $q_2$ and $q_3$ are the accept states; and transitions $(q_1, a, q_2)$, $(q_1, b, q_3)$, $(q_2, a, q_1)$, $(q_2, b, q_2)$, $(q_3, a, q_2)$, and $(q_3, b, q_1)$. Use the GFA algorithm to convert $M$ to a regular expression.

2. Give an algorithm that determines whether a given regular expression generates an infinite language.

3. Give an algorithm that determines whether a given deterministic finite automaton generates an infinite language.