Answer all of the questions. **Check your work.**

1. Draw a state transition diagram of a FSM that decides language \( A = \{ "ab" \} \) over alphabet \( \{ a, b \} \). There is only one string in language \( A \). Be sure to mark the start state and accepting states. Be sure there is a transition out of every state for every symbol in the alphabet.

2. Draw a state transition diagram of a FSM that decides language \( B = \{ x \in \{ a, b \}^* \mid |x| \geq 2 \text{ and the next to last symbol of } x \text{ is } a \} \). Some of the strings in \( B \) are "aa", "bab", "bbaab" and "abaaa". Be sure to mark the start state and accepting states.

   **Hint.** Have a state for each pair of symbols that might be the last two in a string. The state for strings ending on \( bb \) can serve as a start state.
3. Prove that language \( C = \{ a^n b^{2n} \mid n > 0 \} \) over alphabet \{a, b\} is not regular. Make your proof clear and readable, but not verbose. Do not expect the reader to guess what you are doing.