The answers must be the original work of the author. While discussion with others is permitted and encouraged, the final work should be done individually. You are not allowed to work in groups. You are allowed to build on the material supplied in the class. Any other source must be specified clearly.

1. *(10 points)* The following DFA $M1$ accepts all strings that end in 'ab'.
Give a 5-tuple that formally describes the DFA.
Write the transition function as a table.

M1:
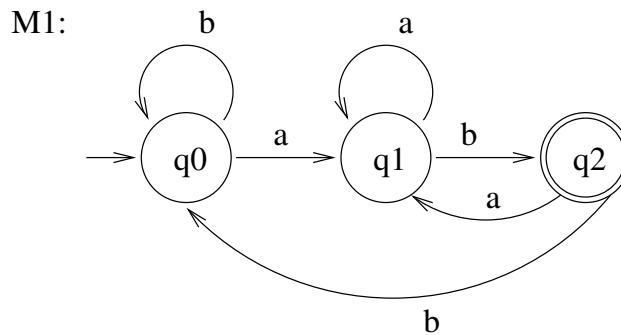
2. *(90 points)* For each of the following languages over $\Sigma = \{a, b\}$:

Build a DFA that accepts the described language. **Explain how the machine works.**

The machines in parts (a) and (b) are 10 points. The machines in parts (c) through (e) are 15 points. **The accompanying "comments" are 5 points.**

(a) The empty set.

(b) The empty string.

(c) The strings that contain at least one a and end in bb.

(d) The strings that start and end with the same symbol.

(e) The strings that contain at least one a and do not contain bb.
(Suggested strings to test your machine with are: $\lambda, a, b, aa, ab, ba, bb, abb, abab, abaab, ababb$.)