1. (20 points) Give a DFA (both a state diagram and a formal description) recognizing the following language. The alphabet is \{0, 1\}.

\{w|w is any string except 11 and 111}\}

2. (20 points) Give a DFA (both a state diagram and a formal description) recognizing the following language. The alphabet is \{0, 1\}.

\{w|w contains an even number of 0s, or contains exactly two 1s\}

3. (20 points) For any string \(w = w_1w_2\cdots w_n\), the reverse of \(w\), written as \(w^R\), is the string \(w\) in reverse order, \(w_n\cdots w_2w_1\). For any language \(A\), let \(A^R = \{w^R|w\in A\}\).

Show that if \(A\) is regular, so is \(A^R\).

4. (20 points) Let \(B_n = \{a^k|\text{where } k \text{ is a multiple of } n\}\). Show that for any integer \(n > 1\), the language \(B_n\) is regular.

5. (20 points) Let \(A/B = \{w|wx \in A \text{ for some } x \in B\}\). Show that if \(A\) is regular and \(B\) is any language then \(A/B\) is regular.