2. (14 pts.) Consider the language $L_1$ of binary strings in which the absolute value of the difference between the number of zeros and number of ones is a multiple of five. Is $L_1$ regular? If so, depict a FSA that recognizes the language, and prove that claim. Otherwise, use the pumping lemma to prove nonregularity.
[additional space for answering the earlier question]
3. (15 pts.) Using the textbook’s method, find a regular expression that is equivalent to the following FSA. Show enough intermediate steps to make it clear that you are following the textbook’s method exactly.
[additional space for answering the earlier question]
4. (15 pts.) Let \(|R|\) denote the cardinality of the language recognized by regular expression \(R\). For each of the following, provide the tightest possible lower and upper bounds on \(|R|\) in terms of \(|R_1|\) and \(|R_2|\), and prove your claims.

(a) \(R = R_1 \circ R_2\)
(b) \(R = R_1 \cap R_2\)
(c) \(R = R_1^*\)