AC32008 Theory of Computation
Tutorial Sheet 4 - Pumping Lemma. 2021 First Class Test.

1. Use the Pumping Lemma to show that the language $\{x \mid x \in \{0,1\}^* \text{ and } x = x^R\}$, where string x^R is the reverse of x (e.g. $abc^R = cba$), is not regular.

The following questions are from the first class test from 2021

3. If Σ is a finite set of symbols, say what is meant by the following, i.e., give the definition:
   (a) The set Σ^*;
   (b) A language over Σ.
4. Write a regular expression for the language that contains strings of 0's and 1's with at most one pair of consecutive 1's.
5. Let L be the set of all strings over $\{0,1\}$ which do not contain 001 as a substring.
   Give a DFA M which accepts L, i.e., such that $L = L(M)$ (you need only give a transition diagram).
6. Let L be the binary language given by
   $$L = \{0^n 1^m, n \leq m\},$$
   Show that L is not regular.
7. Describe informally a procedure to convert a NFA into a DFA that accepts the same language. How many states does the resulting DFA has? How can we eliminate some of these states?