

The first three problems are “standard” pumping lemma problems, where you prove that a given language is not regular by following a standard procedure. Many students have difficulty with such problems at first, but then greatly improve with practice. The only part of such a problem that requires ingenuity is the choice of  $w$ . If after doing these three problems you feel that you need more practice with standard pumping lemma problems, then do more problems from the book and from old exams.

A. 1.29b

B. 1.35

C. 1.53

These last two problems are also about the pumping lemma, but they’re not so standard.

D. 1.54

E. (This is essentially 1.55h, but expanded into three subproblems.) Working over the alphabet  $\Sigma = \{0, 1\}$ , let  $A$  be the language defined by the regular expression  $10(11^*0)^*0$ .

1. Draw a DFA for this language. (Try to do this directly, without converting the regular expression to an NFA and the NFA to a DFA.)
2. Based on the proof of the pumping lemma and your DFA from part 1 of this problem, what pumping length do you expect for  $A$ ? (This question is designed to help you understand the proof of the pumping lemma.)
3. What is the minimum pumping length for  $A$ , as defined by Problem 1.55?