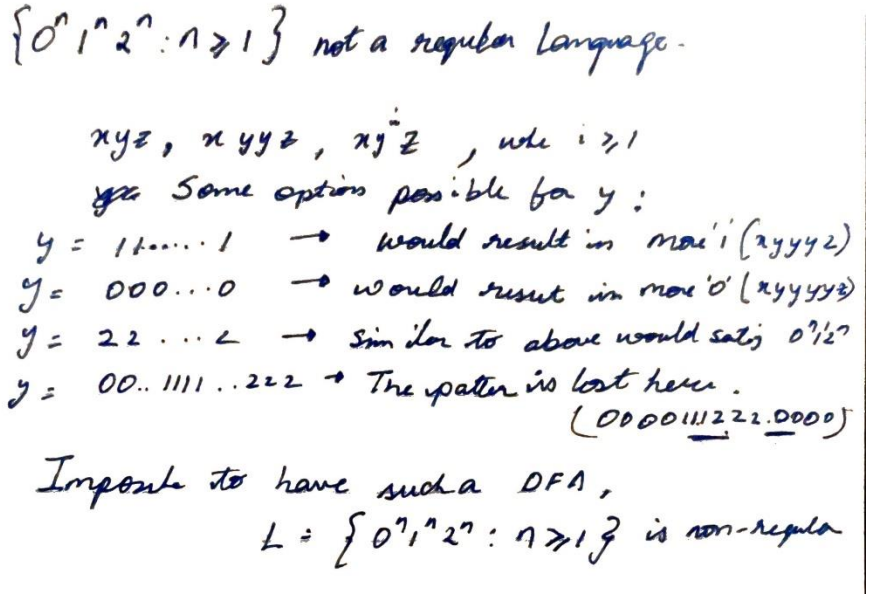
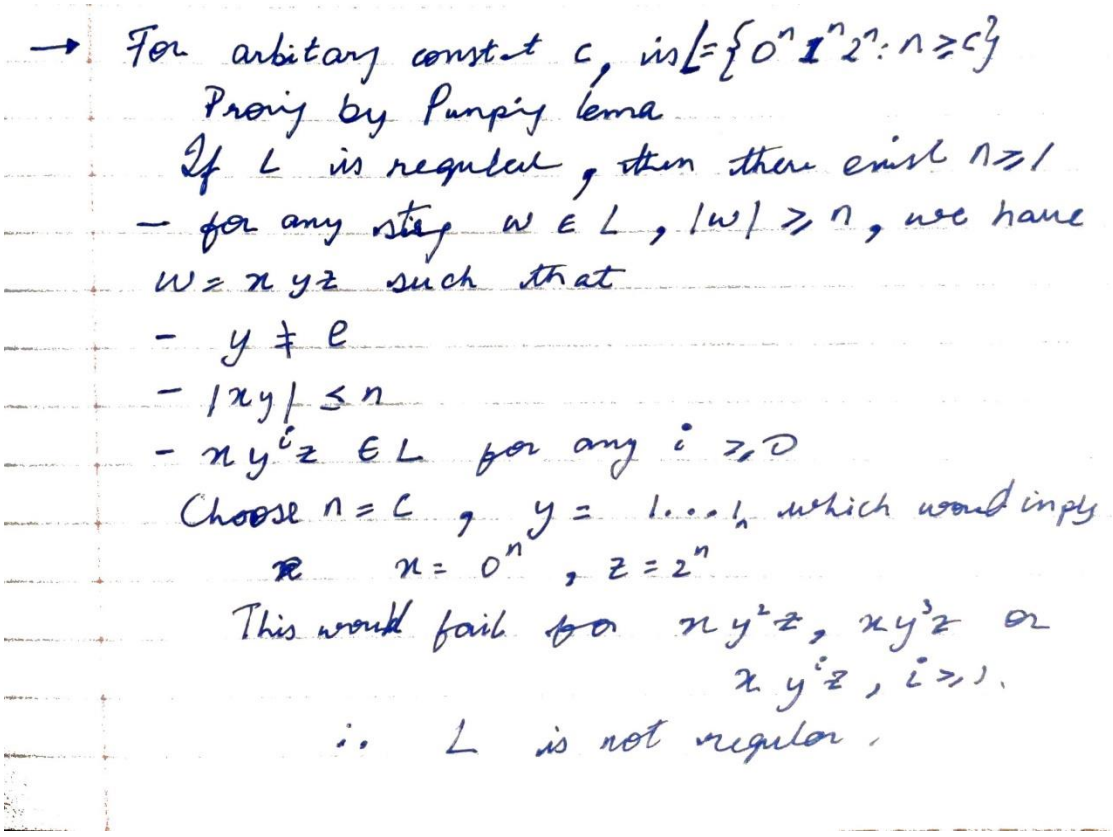
1. Prove that $\{0^n1^n2^n : n \geq 1\}$ is not a regular language.

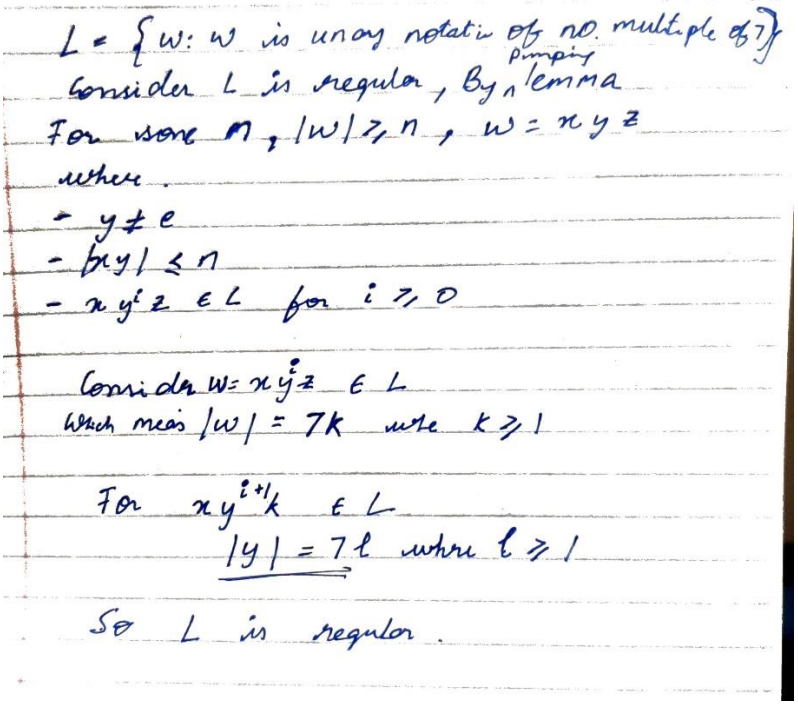


2. For arbitrary constant c, is $\{0^n1^n2^n : n \geq c\}$ regular or not?



3. The decimal notation for a number is the number written in the usual way, as a string over the alphabet $\{0,1,\cdots 9\}$. For example, the decimal notation for 13 is a string of length 2. In unary notation, only the symbol "I" is used; thus 5 would be represented as IIIII in unary

notation. Show that each of the following is or is not a regular language.
(For regular languages, write down its regular expression or describe the automata accepting it; for languages that are not regular, prove it using pumping lemma)
3.1 {w: w is the unary notation for a number that is a multiple of 7}



3.2 {w: w is the unary notation for $10^n, n \geq 1$}