Homework 6

Due: Friday 10/16 before class

Complete the following. The problems should be submitted on paper or via email.

1. (8 points) Write regular expressions for each of the following languages:
   
   (a) Words of 0s, 1s, and 2s such that every 0 is next to exactly one 2 (i.e. 202 doesn’t occur, but every 0 appears as either part of 20 or 02).
   
   (b) Matched parentheses where the parentheses are never more than 3 levels deep (i.e. no point in the line is inside more than 3 levels of parens). To avoid confusion between parentheses in the word and parentheses used for grouping in the regular expression, use ‘o’ and ‘c’ to denote opening and closing parentheses in the word respectively.

2. (12 points) Use the pumping lemma to show that the following languages are not regular. Be very explicit in your argument—missing steps will be assumed incorrect.

   (a) \( A = \{0^n1^b0^{a+b} : a, b \geq 0\} \)

   (b) \( B = \{(01)^m2^m : m \geq 0\} \), which includes the words \( \epsilon, 012, 010122, 010101222, \ldots \)

   (c) \( C = \{0^n1^b0^{a-b} : a, b \geq 0\} \)