ComS 3310 **Spring 2025** **Name:**_____

HW 1 Due: 31 jan 2025

1. Give a regular expression, simplified to the best of your abilities, for the language of **all** strings over $\Sigma = \{a, b, c\}$ where there are at least two non-overlapping occurrences of the string $\alpha\alpha$, where α is a given symbol in Σ (i.e., the string $aaaa$ qualifies, but the string aaa does not, because the first aa and the second aa share a common position in the string). 50

2. Simplify the following regular expressions (give an equivalent regular expression with the smallest number of symbols and operators, you can use the * and $^+$ operators in your answers):

   (a) $a^*aa^*aa^*$

   (b) $(a^*b^*)^*(a + b + \epsilon)$

   (c) $(a^*abb) + (ba^*bb)$

   (d) $a^*(\emptyset b + bb)$

   (e) $aaa^*(ab^*)^*a^*$

   100

3. Give a regular expression, simplified to the best of your abilities, for the language of **all** strings of a's, b's, and c's where a is never immediately followed by b. 50

4. Give a regular expression, simplified to the best of your abilities, for the language of **all** strings of a's, b's, and c's that contain an even number of b's. 50