COT 4210 Homework #3: Section 1.3, 1.4
Assigned: 1/26/2021
Due Date/Time: On Webcourses

1) Give a regular expression generating the following languages:

L_1 = {w | w begins with a 1 and ends with a 0.}
L_2 = {w | w contains the substring 0101}
L_3 = {w | the length of w does not exceed 5}
L_4 = {w | every odd position of w is a 1}
L_5 = { w | w contains an odd number of 1s, or exactly 2 0s. }

2) Prove that the following languages are not regular via the Pumping Lemma:

L_1: $\{0^n1^n2^n \mid n \geq 0\}$
L_2: $\{ww \mid w \in \Sigma^*\}$
L_3: $\{a^{2^n} \mid n \geq 0\}$

3) Prove that $L = \{0^i1^j \mid j \neq i\}$ over the alphabet {0,1} is not regular via the pumping lemma.

4) Using the result in class that if L_1 and L_2 are regular languages, then $L_1 \cap L_2$ is as well, prove the following assertion:

For languages L_1 and L_2, if $L_1 \cap L_2$ is NOT regular and L_1 is regular, then L_2 is not regular.

5) Utilizing the result proven in question #2, show that the following language, L, is not regular:

$L = \{ a^ib^jc^k \mid i \geq 0, j \geq 0, k \geq 0,$ if i = 1, then j = k, otherwise, there are no restrictions of j, k}

6) Attempt to prove that L from question 3 is not regular utilizing the pumping lemma. What problem do you run into?