COSC 312 Homework #5

Name: _____

Netid: _____

1. Produce a context-free grammar (CFG) for each of the following languages, assuming $\Sigma = \{0, 1\}$:

   (a) $\{w \mid w$ starts and ends with different symbols$\}$

   (b) $\{w \mid$ the length of w is an integer multiple of 3$\}$

   (c) $\{ww^R \mid$ i.e., a word followed by that word reversed$\}$

2. Let $G = (\{S, A, B, C, D, E, Z\}, (0, 1), R, S)$,
   where $R = \{S \to E \mid Z; E \to A \mid C; A \to 01B \mid 0A \mid \epsilon; B \to 1B \mid 10A; C \to 10D \mid 1C \mid \epsilon; D \to 01C \mid 0D; Z \to 0Z1 \mid \epsilon\}$.

   (a) Describe the language L (in English) that is generated by the CFG G.

   (b) Prove that the language L generated by the CFG G is **not** regular. **Hint**: use the fact that regular languages are closed under union and prove that one component of the language is not regular by the Pumping Lemma.