CS5104 Assignment 5
Due: Wednesday, April 21

1. For each of the following two CFGs, construct a PDA that accepts the same language they generate, using the algorithm discussed in class.

   i.  \( S \rightarrow aS \mid aSbS \mid a \)
   
   ii. \( S \rightarrow XY \)
       \( S \rightarrow aX \mid bX \mid a \)
       \( S \rightarrow Ya \mid Yb \mid a \)

2. Exercise 6.3.5 from the Textbook.

3. Prove that the language \( \{a^n b^n a^n b^n \mid n > 0\} \) is not context free using pumping lemma.

4. Is the language \( \{a^n b^{3n} a^n \mid n > 0\} \) context free? If so, find a CFG for it. If not, prove so.

5. Prove that the complement of the language \( L = \{a^n b^m \mid n \neq m\} \) is context free, but neither \( L \) nor its complement is not regular.