Tutorial 6

1. Show that acceptance by final state and acceptance by empty stack are equivalent conditions for NPDAs.
2. Show that the following language is not a context-free language:
   (a) $\{a^i \cdot b^j \cdot c^k \mid$ either $i \neq j$ and $j \neq k\}$.
   (b) $\{a^n \cdot b^n \cdot c^i \mid n \leq i \leq 2n\}$.
   (c) $\{a^p \mid p$ is a prime$\}$
   (d) $\{0^i 1^j \mid i = j^2\}$.
3. Give a PDA for the following language $\{0^n 1^m \mid$ either $n = m$ or $2n = m\}$.
4. Show that context-free languages are closed under union, concatenation and homomorphism.
5. Show that if L is a context-free language and R is a regular language then $L \cap R$ is context free.
6. Let us fix a CFG $G = (V, T, P, S_0)$. Given a word $w \in T^*$, checking whether $S_0 \Rightarrow^* w$ or not can be decided by an algorithm that runs in time polynomial in $|w|$.