ComSS 331 **Fall 2017** **Name:**_____

HW 7 Due: 13 oct 2017

1. Let $|x|_a$ be the number of occurrences of the symbol a in the string x.

   - Define a context-free grammar for the language $L = \{w \in \{0,1\}^* : |w|_0 = |w|_1\}$.
   - Give a formal proof that your grammar does indeed generate L.

   100

2. Define a NPDA for the language $L = \{a^n b^m : m, n \in \mathbb{N}, m \leq n \leq 2m\}$. 50

3. Define a NPDA for the language $L = \{uv \in \{0,1\}^* : |u| = |v| \wedge u \neq v^R\}$. 50