Name: _____

1) (15 pts) Let L = $\{0^n \mid \exists x \in Z, n = x^2\}$, a language over the alphabet $\{0\}$. (For example, the strings 0, 0000 and 000000000 are in L, but 00 and 00000 are not.) Prove that L is not regular via the Pumping Lemma for regular languages.

2) (8 pts) A palindrome is a string that reads the same forwards and backwards. Create a Context Free Grammar that describes the language of palindromes over the alphabet {a, b, c}. Note: Your grammar should accept all strings of length 0 and 1, which are palindromes by default. Please label your start symbol S and your other variables with capital letters that I can easily distinguish from lower case a, b and c.

3) (12 pts) Use the algorithm covered in class to draw a PDA that accepts a language equivalent to the one accepted by the grammar below. Please note that your grade is solely based on following the algorithm shown in class. Other equivalent PDAs will not receive full credit. In the grammar below, the start symbol is S, the variables are S, A and B and the terminals are 0 and 1.

S → AB0A
A → ε | BB | 1
B → AB | 00

4) (15 pts) Convert the grammar in question 3 to Chomsky Normal Form. For convenience, the grammar is included below again. (Note: Due to the nature of this particular grammar, there are no unit rules in it, thus, step three contains no work for this particular example.)

S → AB0A
A → ε | BB | 1
B → AB | 00