CS 321
For Tuesday, 23 Feb

Homework #6
Grammars II

1. (closure)
   Most "reasonable" complexity classes are closed under UNION.
   That is, if $S1$ and $S2$ are two sets (of strings) and $S1 \in CLASS$ and $S2 \in CLASS$, then $S1 \cup S2 \in CLASS$.
   Show that each of the CLASSes in the Chomsky Hierarchy is closed under UNION.
   (HINT: Assume that you have a grammar G1 which generates $S1$ and a grammar G2 which generates $S2$, show how to BUILD a grammar G3 which generates (exactly) $S1 \cup S2$.)

2. (regular pumping)
   Use the Pumping Lemma for Regular grammars to show that the set of PRIMES written in unary is NOT a regular language.
   PRIMES $= \{a^p \mid p \text{ is a prime number}\} = \{aa, aaa, aaaaa, \dots\}$.

3. (context free)
   Do Exercise 2.13 from Grammars Notes.

4. (context free pumping)
   Do Exercise 2.18 from Grammars Notes.

5. (context sensitive)
   Do Exercise 2.16 from Grammars Notes

6. (classes)
   Use results in the Notes to show that **CSL** is a proper subclass of **PRIM**,
   where **CSL** is the class of languages which have context sensitive grammars
   and **PRIM** is the class of languages which have primitive recursive acceptors.