CSI 3104, Winter 2007

Assignment #3 Due date: Friday, March 2, 2007 at 8pm

1. Prove that the following language is not regular:
DOUBLE= {the set of all repeated strings, that is, all words of the form SS where S is any string of *a*'s and *b*'s}= { *aa, bb, aaaa, abab, baba, aaaaaa, aabaab, abaaba, abbabb,…*}.

2. Prove that the following language is not regular:

Equal-sum = $\{a^m b^n a^p b^q$ where $m+n= p+q\}$.

3. Exercise # 3, 6(i) page 204
Define the language SQUARE as follows:
SQUARE= {*a, aaaa, aaaaaaaaa, …*} = $\{a^n$, where $n=k^2$ is a square of an integer$\}$.
Use pumping lemma to show that SQUARE is nonregular.

4. Exercise # 18 page 221
Construct a decision procedure to determine whether a given FA accepts at least one word that starts with an *a*.

5. Exercise # 11 page 256
Write a CFG to generate the language MOREA of all strings that have more *a*'s than *b*'s.
MOREA={ *a, aa, aab, aba, baa, aaaa, aaab, aabab, …*}.

6. Exercise # 17 page 257
Show that the following CFGs that use **Λ** are ambiguous:

(i) S → XAX
X → aX | bX | **Λ**

(ii) S → aSX | **Λ**
X → aX | a

(iii) S → aS | bS | aaS | **Λ**

(iv) Find unambiguous CFGs that generate these languages.

(v) For each of these languages, find an unambiguous grammar that generates exactly the same language except for the word **Λ**. Do this by not employing the symbol **Λ** in the CFGs at all.