CS154 Assignment 3. Solutions to problem 4

February 7, 2001

We assume that the given grammar is

1. Free of ϵ productions from non start symbols. ϵ productions are productions of the form $\mathbf{A} \rightarrow \epsilon$
2. Free of unit productions of the form A $\rightarrow$ B , where A and B are non-terminals.
3. Remove useless symbols from the grammar

Note that the conversion of any arbitrary grammar to a form described above was discussed in the class. Given such a grammar , we draw a graph G. The vertices of G are the non-terminals of the grammar. We add a directed edge from a non terminal A to a non-terminal B if there is a production of the form

$$\mathrm{A} \rightarrow \alpha \mathrm{B} \beta$$

It is easy to see that the grammar produces infinite number of strings if and only if this graph has a cycle. The proof is left as an exercise.