CSC 501 - Assignment #1
version 3.2

Due Friday 9/19/14 in Class

Problems

Given the grammar $G = (\Gamma, \rightarrow, \gamma)$:

- $\Gamma = T \cup N$ where
  
  \begin{align*}
  T &= \{0, \ldots, 9, a, \ldots, z, \text{true}, \text{false}, \text{skip}, \text{if}, \text{then}, \text{else}, \text{while}, \text{do}, \text{end}+, -, *, =, \leq, !, &, ||, ::, ;,(, )\} \\
  N &= \{A, B, C, D, L, V\}.
  \end{align*}

- The rule set $\rightarrow$ is defined by the BNF style rewrite rules:
  
  \begin{align*}
  A &\rightarrow D \mid V \mid A + A \mid A - A \mid A \ast A \mid (A) \\
  B &\rightarrow \text{true} \mid \text{false} \mid A = A \mid A \leq A \mid B \mid B \& B \mid B \mid B \mid (B) \\
  C &\rightarrow \text{skip} \mid V := A \mid C ; C \mid \text{if } B \text{ then } C \text{ else } C \text{ end} \mid \text{while } B \text{ do } C \text{ end} \\
  D &\rightarrow L \mid - L \\
  L &\rightarrow 0 \mid L \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9 \\
  V &\rightarrow a \mid V \mid V \mid z \mid a \mid \ldots \mid z
  \end{align*}

- $\gamma = C$.

Do the following problems:

1. Derive at least three strings that belong to $L(G)$. Show your derivations.

2. Formally prove that the string ‘while true do skip end’ is a member of $L(G)$.

3. Is the string ‘if true then skip end’ a member of $L(G)$? Why? Why not?

4. Add a rule to the above grammar that would add the command ‘repeat-until’ to the language. Show that your grammar works by showing that you can derive a program that contains the ‘repeat-until’ command.