Task. For the grammar described in Homework 7, show how the word a01 can be represented as $uvxyz$ in accordance with the pumping lemma for context-free grammars. Show that the corresponding word $uvvxyyz$ will be generated by this grammar.

Solution. The derivation of this string takes the following form:

```
N
  /\  /
 N   D
   /\  /
 N   D
   /\  /
 L   D
   /\  /
 L   0
   /  /
  a
```

The lowest pair of occurrences of the same variable is the lowest pair of occurrences of the variable $N$: 
Thus, the desired decomposition of this word into $u$, $v$, $x$, $y$, and $z$ has the following form:

So, here $u = v = \varepsilon$, $x = a$, $y = 0$, and $z = 1$. If we copy of the part between the two lowest occurrences of $N$ to the lower occurrence, we conclude that the word $uvvxyyz$ can be derived as follows: