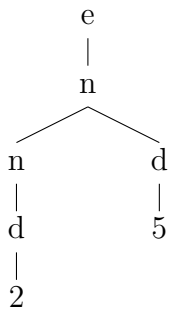
CIS 425 Assignment 1

Zhexin Jia

April 22, 2017

1. (4.1)



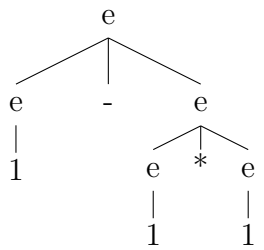
Yes, there are many other derivations for 25.

Example: $e- > e + e- > nd + n- > dd + d- > 24 + 1- > 25$

Yes, there are many other parse trees for 25. Since there are lots of different derivations for 25, every single derivation can build a different parse tree.

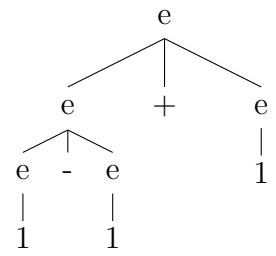
2. (4.2)

(a). $1 - 1 * 1$

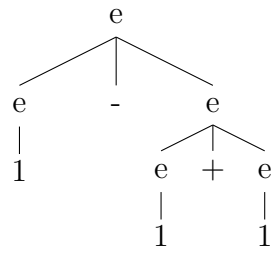


(b). $1 - 1 + 1$

left associativity:

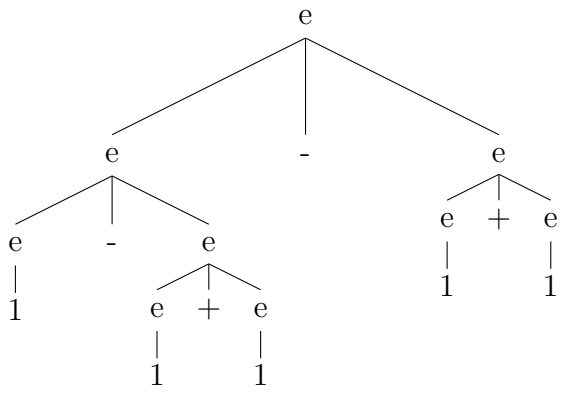


right associativity:

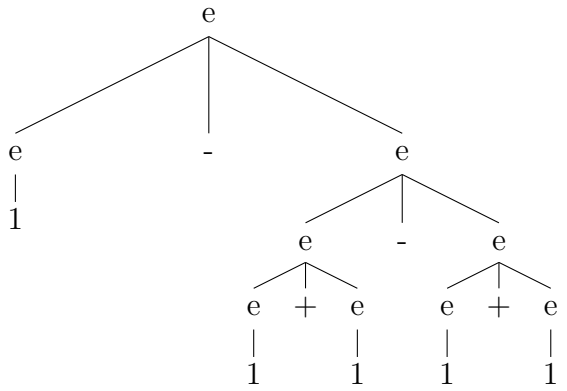


(c). $1 - 1 + 1 - 1 + 1$ (+ has higher precedence than -)

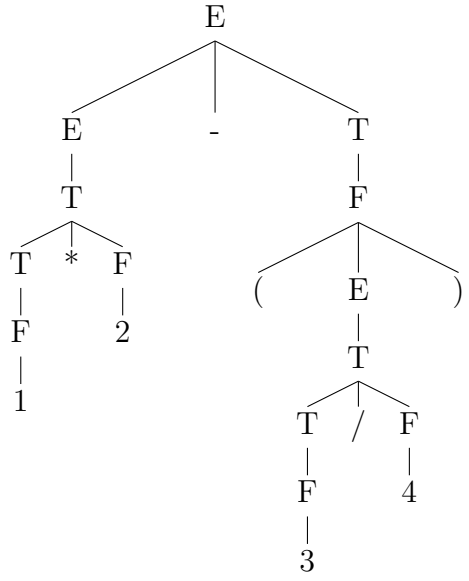
left associativity:



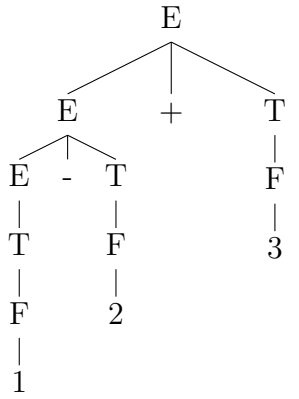
right associativity:



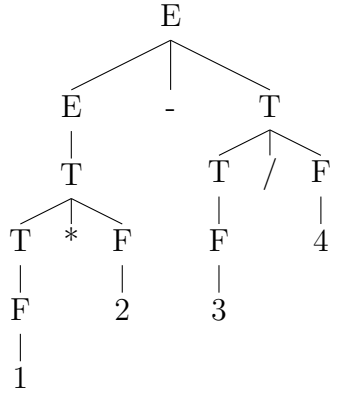
3. (a).



(b).



(c).



4. What language does this grammar generate?
   $S := aSa|aBa$
   $B := bB|b$

   The language $L = \{aba, aabaa, abba, aabbaa, aaabbaaa, ...\}$
   $= \{a^n b^m a^n | m >= 1, n >= 1\}$

   The language L consists at least 1 a and 1 b. all the b's are consecutive. The number of a's in the left side of b's is equal to the number of a's in the right side of b's.

5. What language does this grammar generate?

$S := abScB|\varepsilon$

$B := bB|b$

The language $L = \{\varepsilon, abcb, ababcbcb, abababcbbbbbcbbbcbb...\}$

$= \{(ab)^n(cbb^*)^n | n >= 0\}$

6. Let L be language over alphabet a, b, c which consists of at least three consecutive b's. Write BNF grammar for L.

$E := TbbbT$

$T := aT|bT|cT|\varepsilon$

7. Find a CFG that generates the language $a^n b^m | 0 <= n <= m <= 2n$.

$S := aSbb|aSb|\varepsilon$

8. Find a CFG that generates words formed from 0, 1 that begin and end with the same symbol.

$S := 0T0|1T1$

$T := 0T|1T|\varepsilon$