

10.2

- Relating parse trees and derivations (not as in book)

DEF A cut in a tree is a maximal set of unordered nodes.
 $\rightarrow$ every path from root to leaf is represented once

Note that cuts are preserved under replacing an element by its children!

DEF $c_1 \prec c_2$ if c_2 can be obtained from c_1 by replacing some node by its children

least cut: $\{\text{root}\}$, greatest cut: Leaves!

Now, observe that one-step derivations correspond exactly to moving from a cut to a follower cut!

- From parse tree for w in G to derivation of w in G

maximal sequences of cuts correspond to derivations!

(but note that in an ambiguous grammar the reverse does not hold necessarily) Ex: left-most deriv. are unique for a given parse tree!

- From derivation to parse tree

inductively from left to right, for every one-step derivation, add children to respective leaf as specified by a possible production for this derivation (not unique!)

Ex: $S \xRightarrow{G} aSA \xRightarrow{G} aaAA \xRightarrow{G} aaAb \xRightarrow{G} aabb$
 for $G: S \rightarrow aA \mid aSA$
 $A \rightarrow b$

One-to-one correspondence between parse trees and l.m. derivations

