Parsing algorithm - Cocke-Kasami-Younger (CKY)

Assumptions: G is in CNF

Given $w \in \Sigma^*$, check if $S \xrightarrow{*} w$

(and find a derivation)

$w = w_1 w_2 \ldots w_n$

$\exists A, B$ s.t $S \to AB$, $A \xrightarrow{*} w_1 \ldots w_i$, $B \xrightarrow{*} w_{i+1} \ldots w_n$ for some $1 \le i \le n$

- Try out all possible choices of i & recursively check if $A \xrightarrow{*} w_1 \ldots w_i$ & $B \xrightarrow{*} w_{i+1} \ldots w_n$ for each production $S \to AB$

$D(i,j) = \{ A \in N \mid A \xrightarrow{*} w_{i+1} w_{i+2} \ldots w_j \}$

Algorithm: Compute $D(0,n)$ & check if $S \in D(0,n)$

$D(i,j) = \{ A \mid A \to BC \text{ \& } B \in D(i,k) \text{ \& } C \in D(k,j),\ i < k < j \}$

Base case of the recursion?

Example: $S \to AB \mid BA \mid SS \mid AC \mid BD$

$A \to a \quad B \to b$

$C \to SB \quad D \to SA$

$w = aabbab$

	0	1	2	3	4	5	6
0		A	ϕ	ϕ	S	D	S
1			A	S	C	S	C
2				B	ϕ	ϕ	ϕ
3					B	S	C
4						A	S
5							B
6							

$D(0,2) = \{ A \mid A \to BC,\ B \in D(0,1),\ C \in D(1,2) \}$

$D(0,3)$

aab

$D(0,1) \quad D(1,2)$

$D(0,2) \quad D(2,3)$

abb

$D(1,2) \quad D(2,4)$

$D(1,3) \quad D(3,4)$

SB

$S \overset{*}{\to} ab \quad B \overset{*}{\to} b \quad C \to SB$