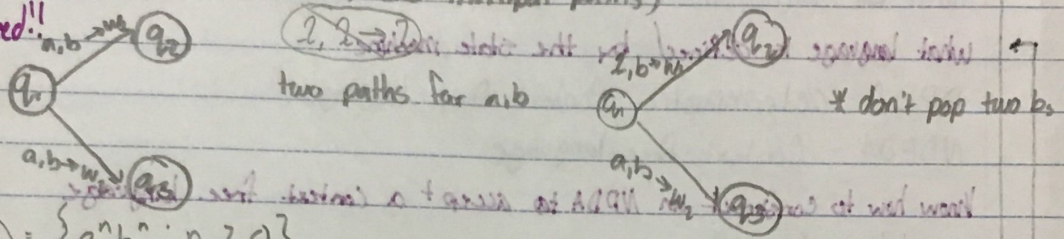


# Final Study Guide

1) DPDA's - know how to construct a DPDA to accept a deterministic context-free language

\* DA Rules They are like DFA (no multiple paths)

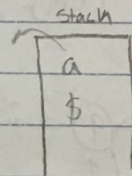
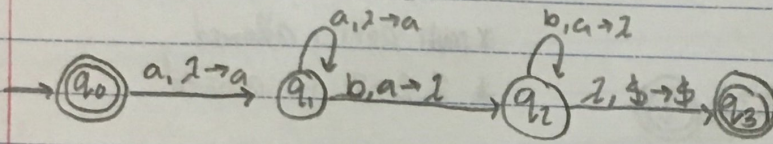
Not Allowed!!



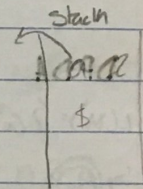
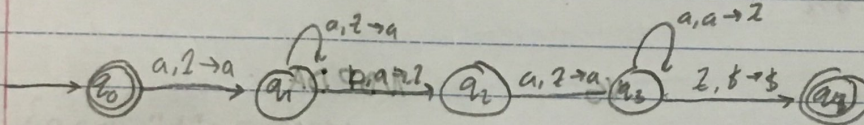
## format

input  $a, b \rightarrow 2$   
push  $\uparrow$   
pop

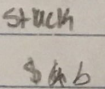
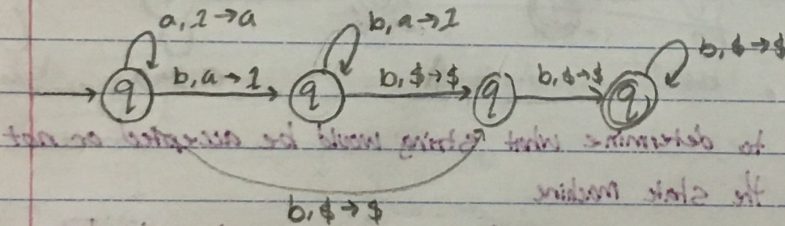
ex)  $L(m) = \{a^n b^n : n \geq 0\}$



ex)  $L(m) = \{a^n b a^n : n \geq 0\}$



\* ex)  $L = \{a^n b^m : m \geq n+2\}$



Understanding a deterministic Context-free language (if some DPDA accepts it)

Context-Free language. A language  $L$  is Context-free iff and only if there exists a grammar  $G$  with  $L = L(G)$

Context-Free Grammar -  $G = (V, T, S, P)$

- $V$ : Variables
- $T$ : terminal symbol
- $S$ : start variable
- $P$ : Production of the form  $A \rightarrow x$  where  $x$  is a string of variables and terminals

ex)  $G: S \rightarrow aSa$

$S \rightarrow bSb$

$S \rightarrow \epsilon$

$S \Rightarrow aSa \Rightarrow abSba \Rightarrow abba$

(AQA, AQAQ) equivalent with itself

Leftmost derivation  $S \Rightarrow AB \Rightarrow aaAB \Rightarrow aaB \Rightarrow aaBb \Rightarrow aab$

Rightmost derivation  $S \Rightarrow AB \Rightarrow ABb \Rightarrow Ab \Rightarrow aaAb \Rightarrow aab$



how to evaluate a DPDA to determine what strings would be accepted or not (1)

Something must be matched from the stack. Stack must be empty and must be deterministic Context-free

what language is defined by the state machine

DPDA - deterministic Context-free language

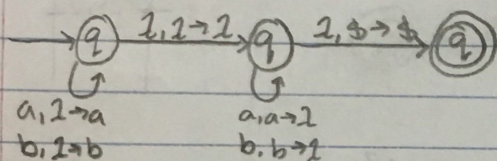
NDPDA - Context-free language

Know how to construct an NPDA to accept a context free language

ex)  $L(M) = \{ww^R\}$

\* multi paths allowed

\*  $1, 2 \rightarrow 1$  is allowed



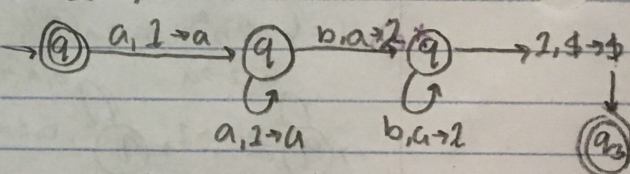
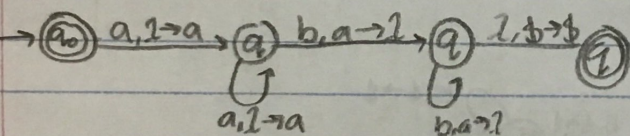
DPDA

VS

NDPDA

$L(M) = \{a^n b^n : n \geq 0\}$

$L(M) = \{a^n b^n : n \geq 0\}$



how to evaluate an NPDA to determine what string would be accepted or not

what language is defined by the state machine

Know the difference between regular and context free grammars and how to tell

the difference, e.g. through pumping lemma, acceptance by NPDA

Regular Grammar (DFA, NFA) - expresses a language

V - set of variables

variables

\* left linear / right linear is a

S - start variable

grammar

T - set of terminal symbols

terminal symbols

P - set of production rules

$G(V, T, S, P) \leftarrow P, \{S \rightarrow aSb \mid S \rightarrow \epsilon\}$

$\{S\} \uparrow T = \{a, b\}$

Context-Free Grammars (DPDA, NDPDA)

V - set of variables

$G(V, T, S, P)$

variables

T - terminal symbols

terminal symbols

S - start variable

P - production of the form  $A \rightarrow x$

$\leftarrow$  string of variables and terminals