Pushdown Automata

A machine where the memory is a stack of infinite capacity.

On each step the machine reads on input (or not) reads top of the stack and pops / pushes or keeps stack.

PDA $=(Q, \Sigma, \Gamma, \delta)$ $\delta : Q \times \{\Sigma \cup \{\epsilon\}\} \times \{\Gamma \cup \{\epsilon\}\} \to P(Q \times \{\Gamma \cup \{\epsilon\}\})$

Watch class video on 02/24 for an example of a drawn out PDA (I am too lazy to draw it :sob:)

Pumping Lemma for context free languages

Think of giant tree, some states must repeat so we are left with the following pumping lemma:

If L is context free, $\exists p$ such that for all $s \in L, |s| > p$,

- $s = uvxyz$
- $|vxy| \leq p$
- $|vy| > 0$

$uv^k xy^k z \in L \forall k = 0, 1, 2..$

EX

$L = \{a^n b^n c^n | n \geq 0\}$

Prove L is not context free

Assume L is context free, thus there exists a p such that for all $s, |s| > p : s = uvxyz$

Let $s = a^p b^p c^p$

Since $|vxy| \leq p$, there are 5 cases.

$vy = a^*, vy = a^* b^*, vy = b^*, vy = b^* c^*, vy = c^*$