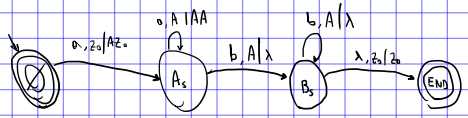
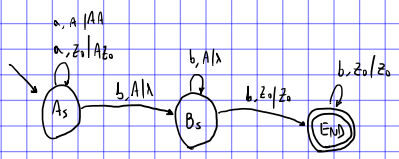
1. Para cada uno de los siguientes lenguajes, construir un autómata de pila que los acepte. Hacer también una versión determinística en los casos en que sea posible.

(a) $\{a^n b^n\}$ $n \geq 0$



$S \rightarrow aSb \mid \lambda$

(b) $\{a^n b^m \mid m > n\}$

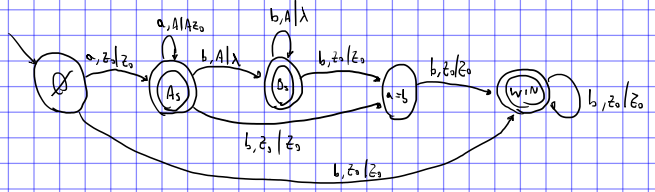


$F = SB$

$B = bB \mid b$

$S = aSb \mid \lambda$

(c) $\{a^n b^m \mid m \neq n\}$



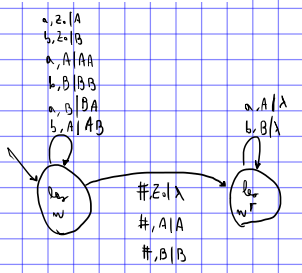
$A = aA \mid a$

$B = bB \mid b$

$S = aSb \mid \lambda$

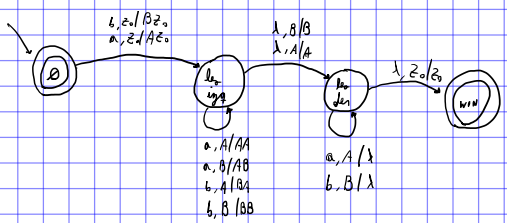
$F = AS \mid SB$

(d) $\{\omega \# \omega^r \mid \omega \in \{a, b\}^*\}$



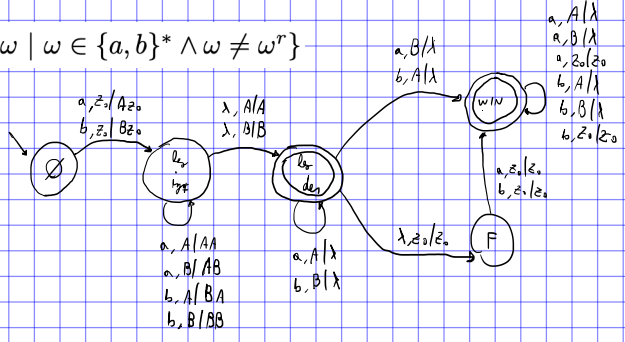
$S = \# \mid aSa \mid bSb$

(e) $\{\omega \mid \omega \in \{a, b\}^* \wedge \omega = \omega^r\}$



$S = \lambda \mid a \mid b \mid aSa \mid bSb$

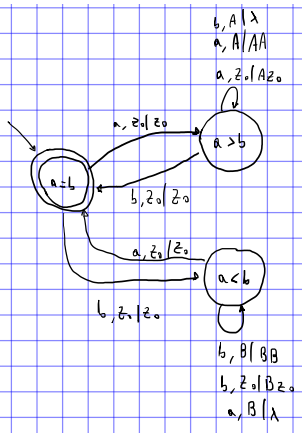
(f) $\{\omega \mid \omega \in \{a, b\}^* \wedge \omega \neq \omega^r\}$



$P = aPa \mid bPb \mid a \mid b \mid \lambda$

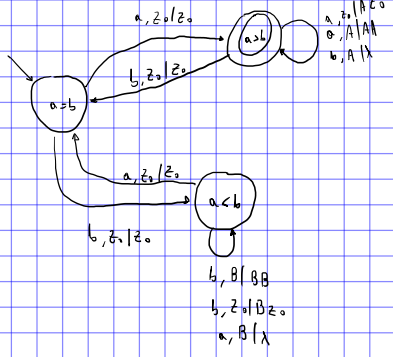
$R = aPb \mid bPa \mid ab \mid ba \mid aRa \mid aRb \mid bRa \mid bRb$

(g) $\{\omega \mid \omega \in \{a,b\}^* \wedge |\omega|_a = |\omega|_b\}$



$S = \lambda \mid aS_b \mid bS_a \mid SS$

(h) $\{\omega \mid \omega \in \{a,b\}^* \wedge |\omega|_a > |\omega|_b\}$



$S = \lambda \mid aS_b \mid bS_a \mid SS$

$\rightarrow F = SaS \mid Fa \mid aF$