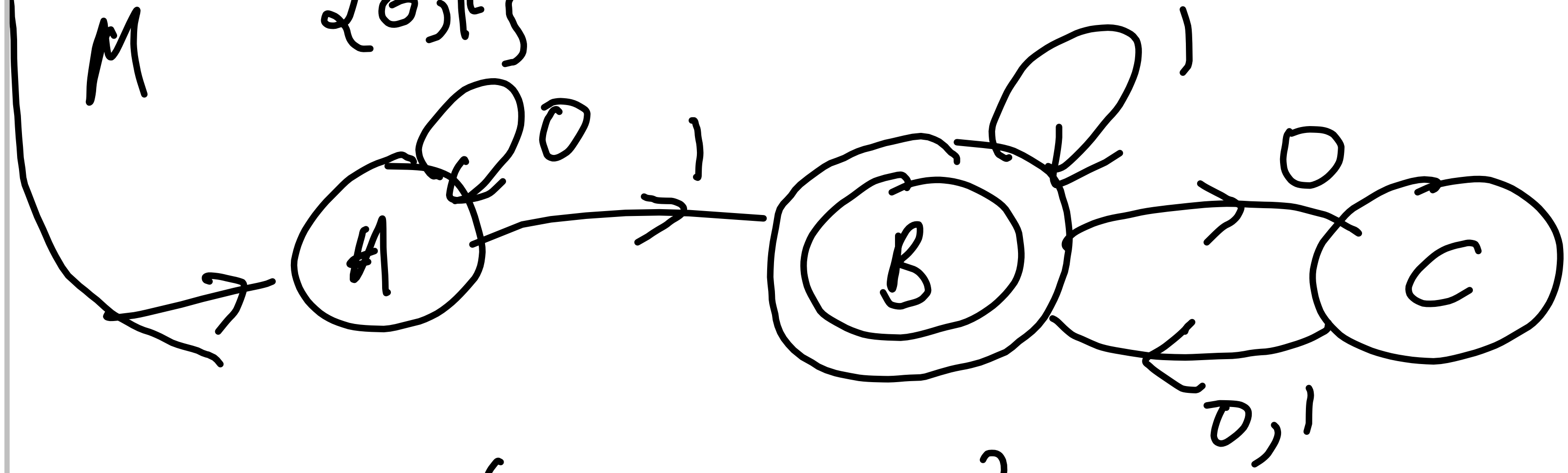
CS273 1/23/07

Admin Info

1. HW1 posted, due on Friday
2. Web survey for head banging sessions, due Friday
3. Midterm dates: Feb 22, April 3
4. Newsgroup?

M $\{0,1\}$



$L(M) = \{ w \mid ?? \}$

accept: 1, 01, 11, 11111, 100

reject: 0, 00, 10,

$L(M) = \{ w \mid$ w contains a 1 and there are an even # of 0's after the last 1 $\}$

$$M = (Q, \Sigma, \delta, q_0, F)$$

$$Q = \{A, B, C\}$$

$$\Sigma = \{0, 1\}$$

$$\delta : Q \times \Sigma \to Q$$

$$q_0 = A$$

$$F = \{B\}$$

$F = B$ ✗

Q \ Σ	0	1
A	A	B
B	C	B
C	B	B

$L(M)$ – language accepted by M

– $\{w \mid M \text{ accepts } w\}$

– $\{w \mid M$ when started in q_0, reads w and enters a final state $\}$

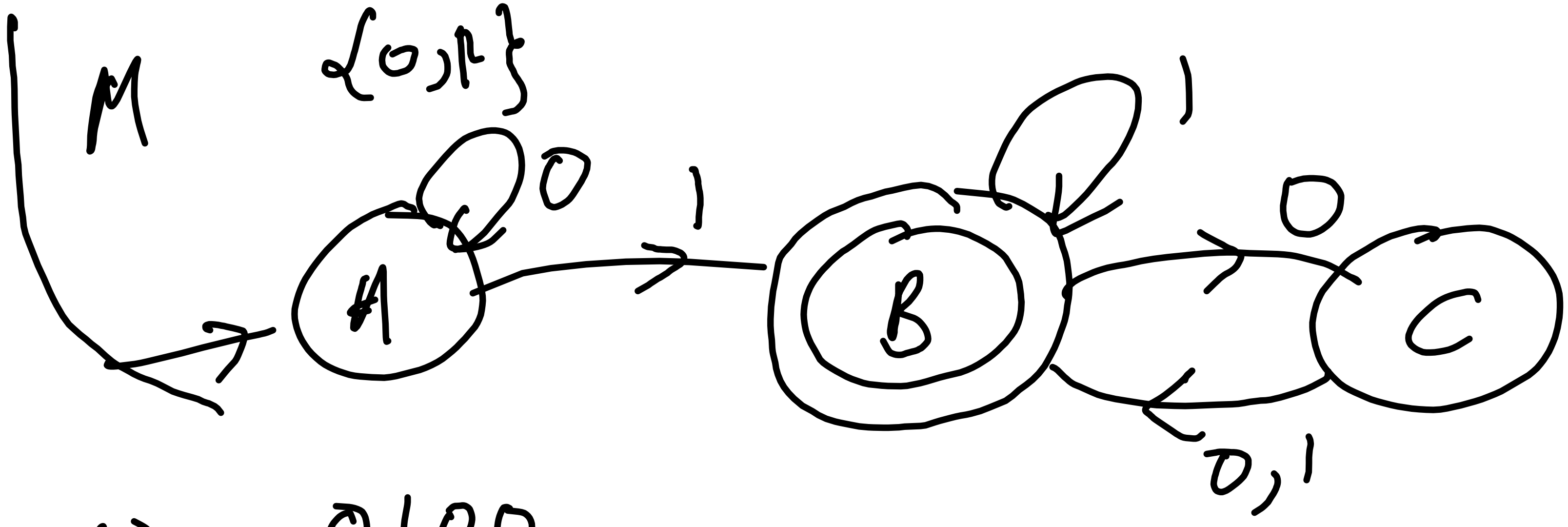
Formal definition

Let $M = (Q, \Sigma, \delta, q_0, F)$

and let $w = w_1 w_2 \cdots w_n$ be a string in Σ^*

M accepts w iff there is a sequence of states ~~r_0~~ $r_0\, r_1\, r_2 \cdots r_n$ ~~in~~ from Q s.t

1. $r_0 = q_0$
2. $\delta(r_i, w_i) = r_{i+1}$ $\quad i = 0, 1, \ldots, n-1$
3. $r_n \in F$



$w = 0100$

$r_0 = q_0 = A$

$r_1 = \delta(A, w_1) = \delta(A, 0) = A$

$r_2 = \delta(A, w_2) = \delta(A, 1) = B$

$r_3 = \delta(B, w_3) = \delta(B, 0) = C$

$r_4 = \delta(C, w_4) = \delta(C, 0) = B$ GF!

A A B C B

010 is not accepted.

$L(M) = \{ w \mid w \text{ is accepted by } M \}$

Defn: A language is regular if it is recognized by a DFA M.

L is regular if $\exists M$ s.t. $L = L(M)$

~~Ex~~ Designing DFA's for given language.

<u>Ex 1.</u> $\Sigma = \{a, b\}$

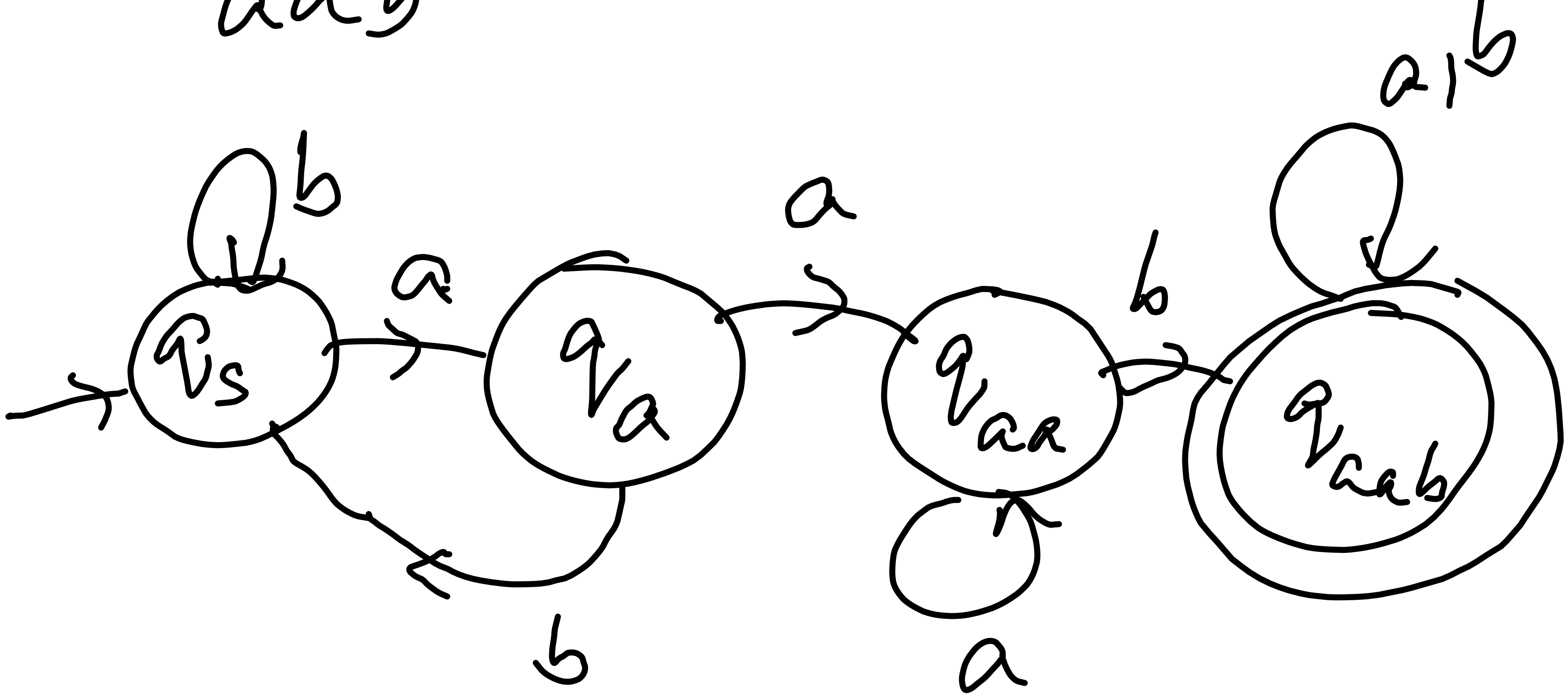
$L = \{ w \mid w$ contains "aab" as a ~~substring~~ subsequence $\}$

"finite memory"

"read once"

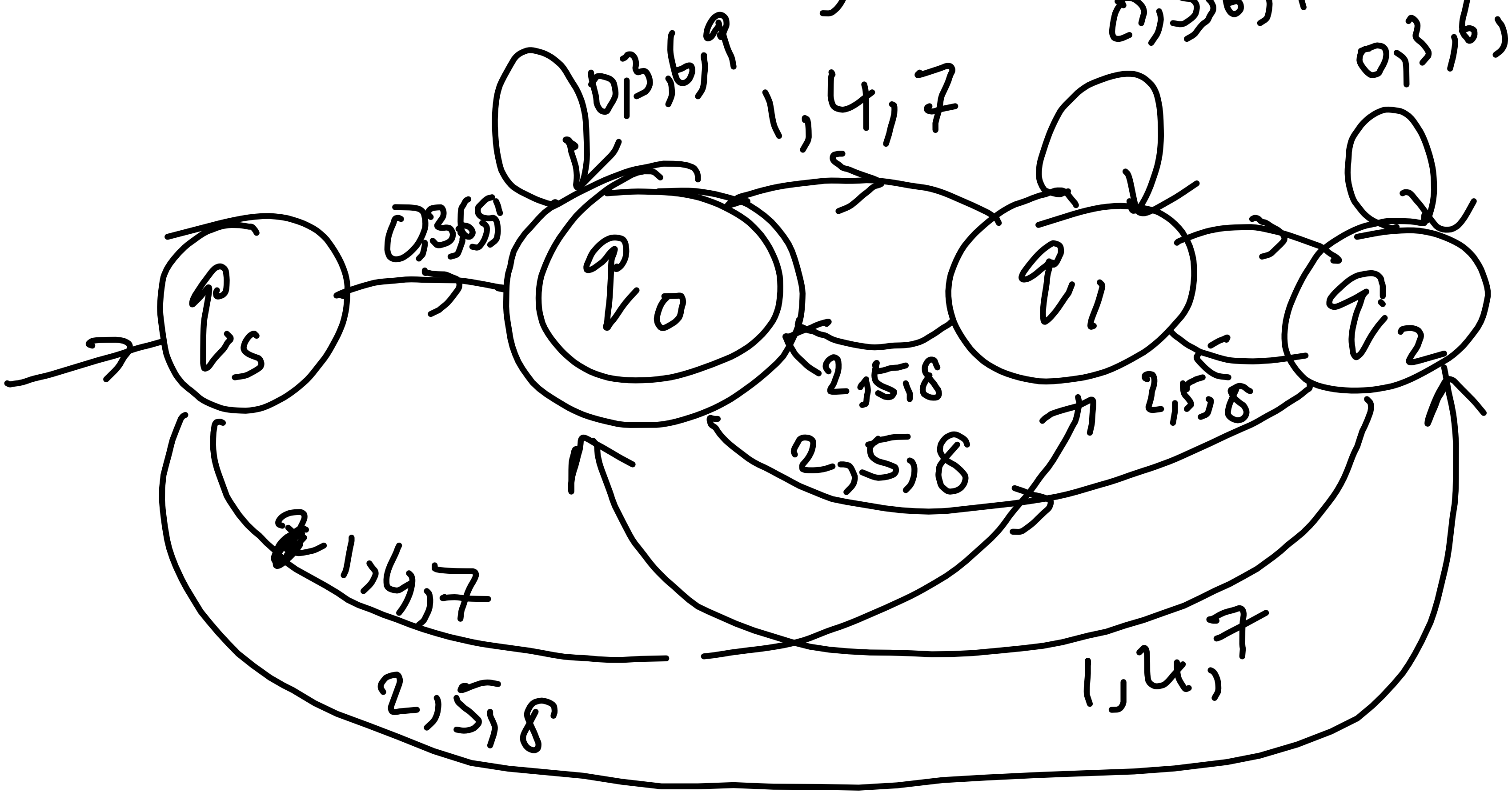
"String can end at any point"

"aab"



Ex2: $\{0, 1, 2, \dots, 9\} = \Sigma$

$L = \{ w \mid w$ as decimal # is divisible by 3 $\}$



M_1 which accepts L_1

M_2 accepts L_2

is there a machine

M which accepts $L_1 \cup L_2$

$L_1 \cap L_2$

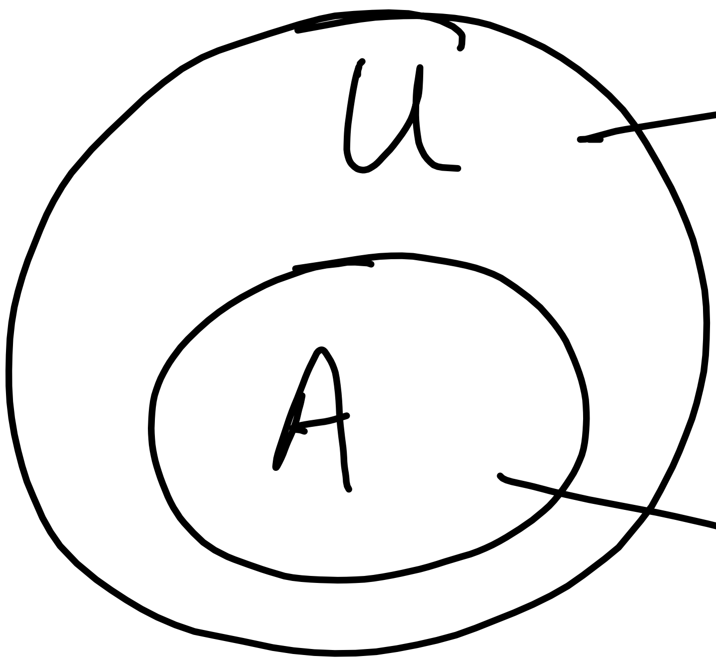
Closure properties of languages.

$N = \{1, 2, 3, \ldots, \}$

$x, y \in N \Rightarrow x + y \in N$

N is **closed** under **addition operation**

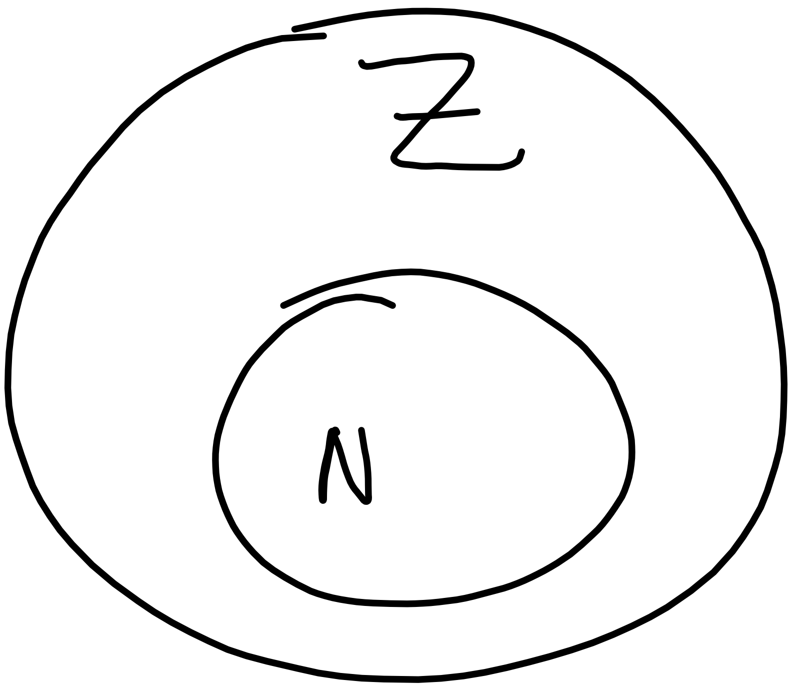
Operation is defined over a larger set



universe (implicit)

set operation

$\mathbb{N} = \{1, 2, 3, \ldots\}$



$\mathbb{N}$ is <u>not</u> closed under <u>subtraction</u>

$\mathbb{Z} = \{-\infty, \ldots, 0, 1, 2, \ldots\}$

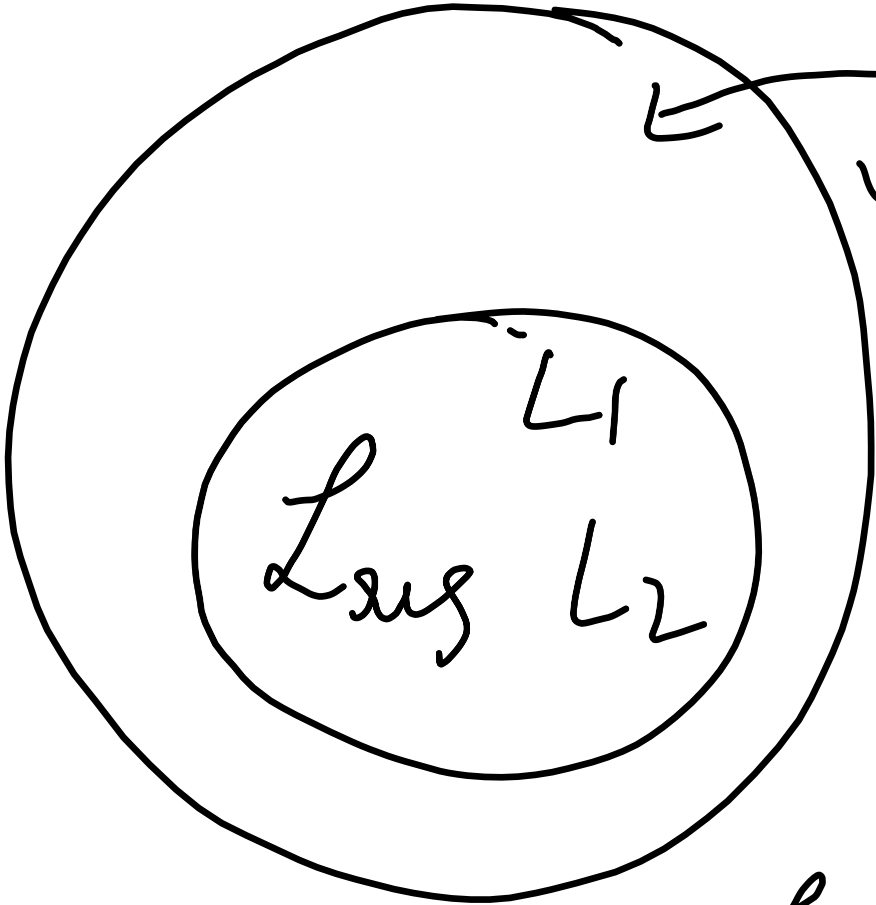
$\mathcal{L}_{reg} = \{ L \in \Sigma^* \mid L \text{ is regular} \}$

is $\mathcal{L}_{reg}$ <u>closed</u> under <u>union</u>?

that is

if $L_1 \in \mathcal{L}_{reg}$ $L_2 \in \mathcal{L}_{reg}$

is $L_1 \cup L_2 \in \mathcal{L}_{reg}$?



set of "all" languages over Σ

$\mathcal{P}(\Sigma^*)$

Σ

Σ^*

$L \subseteq \Sigma^*$

$\mathcal{L}_{reg} \subseteq \mathcal{P}(\Sigma^*)$