

Math 322

Q's

134

3e

$0101 \in (01)^*(11)^*$

$0 \leq i \leq 2 \leq 3$

$0 \leq i \leq 2 \leq 3 \dots$

Note $\emptyset a^* = a^*$

$\emptyset a^* b = b$

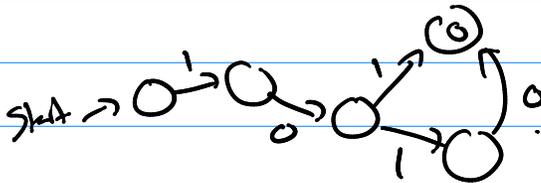
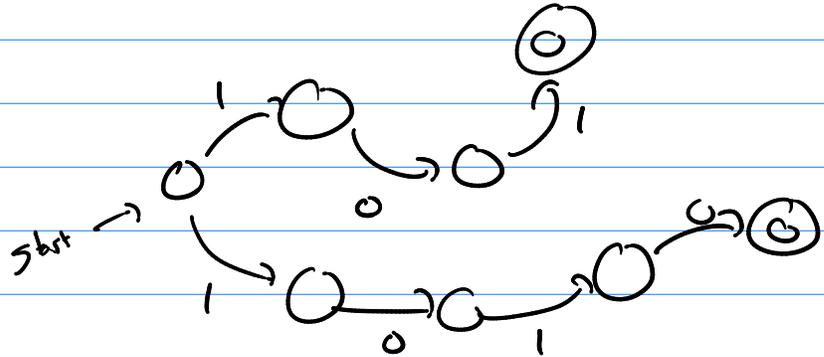
$(01)^2 (11)^0$

$0101 \tilde{r} = 0101$

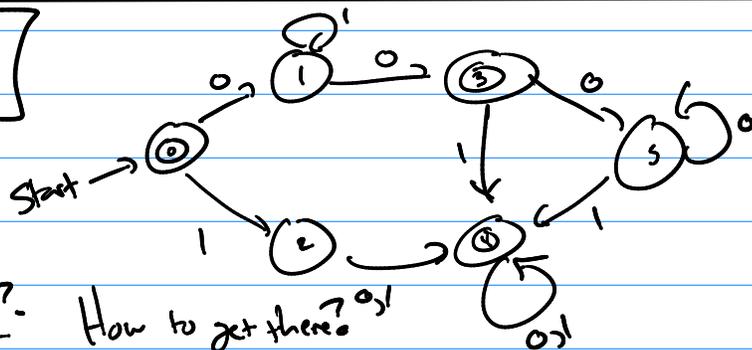
"Creation" of DFA

101

1010



133 #21



$L(M)$

Final states?

How to get there?

S_0

\emptyset ← string of no length = no input

S_3

01^*0

S_4

$(01^*01, 01^*000^*1, 10, 11)(0,1)^*$

$L(M) = \{ \emptyset, 01^*0, (01^*01, 01^*000^*1, 10, 11)(0,1)^* \}$ ←

Computability

Computable

- a turing machine exists that ^{computes} solves your number theoretic function

uncomputable

- no turing machine

$|\mathbb{R}|$ vs $|\mathbb{Z}^+| = \aleph_0$ (not-finite, countable)

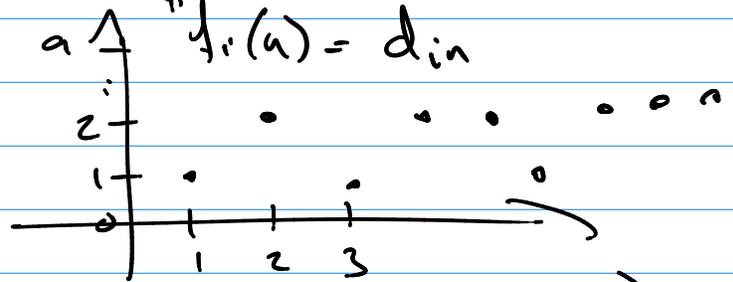
$|\mathbb{R}| > |\mathbb{Z}^+|$

$|\mathbb{R}| = \aleph_1$ not countable

Idea of proof: \mathbb{R} from 0 to 1

$r_i = 0.d_{i1}d_{i2}d_{i3} \dots$

$r = 0.121221222\dots$



b/c it is based on $|\mathbb{R}|$

we know |number theoretic functions| $\neq \aleph_0$ (not countable)

- and
- any turing machine is simply a subset of Σ -tuples.
 - or any effective algorithm was language which is also countable.

So

Computability

|Computable| - countable

|uncomputable| - not countable

uncomputable functions?

- (ex) - take a blank tape
- take all Turing machines with n -states and $I = \{1, B\}$

$$|\text{all } T| = 2^{2 \cdot 151^2 \cdot 11^2} = 256^{n^2}$$

$B(n)$ of all possible Turing machines run them on a blank tape. Of the ones that halt --
 $B(n) = \text{max of } 1\text{'s left on tape.}$

$$B(2) = 4$$

$$B(3) = 6$$

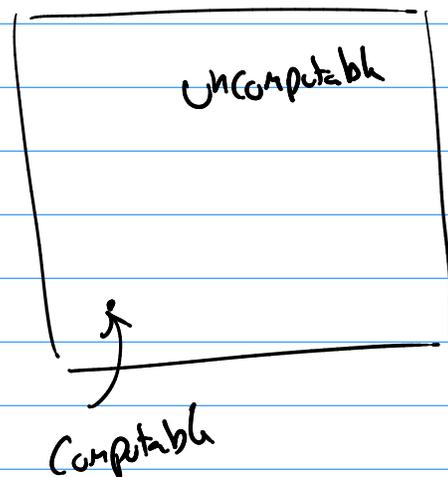
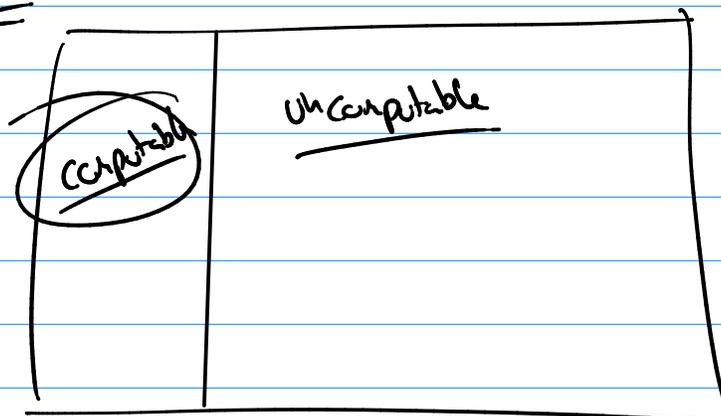
$$B(4) = 13$$

$$B(5) = ? \geq 4098$$

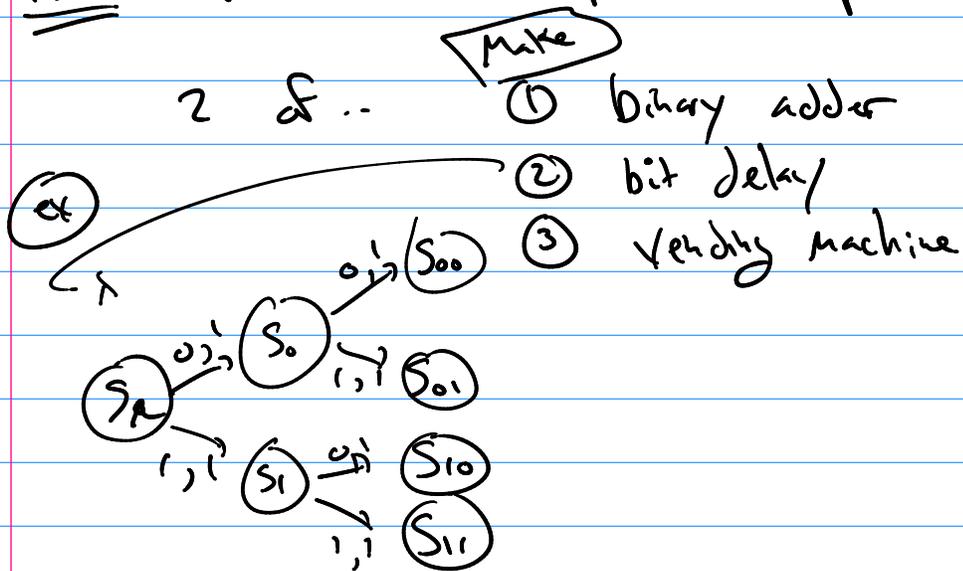
$$B(6) = ? \geq 3.5 \times 10^{18267}$$

$$B(7) = ? \geq 10^{10^{10^{18705353}}}$$

All Problems



13.2 F.S.M. with output (2 probs)



13.3 F.S.A (3 probs)

① given language \rightarrow be creative and create F.S.A

② find $L(M)$ (det FSA)

③ find $L(M)$ (non-det FSA)

13.4 Language Recognition (2 probs)

① given L create non-det FSA inductively

② given productions create F.S.A.

13.5 Turing Machine (7 probs)

① run a turing machine.

② make T for ... a) $M_1 + M_2$?

b) $M \text{ mod } (M)$?

c) $M - (K)$?