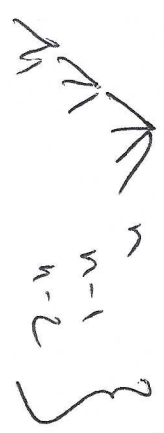


Computational complexity (whole course)

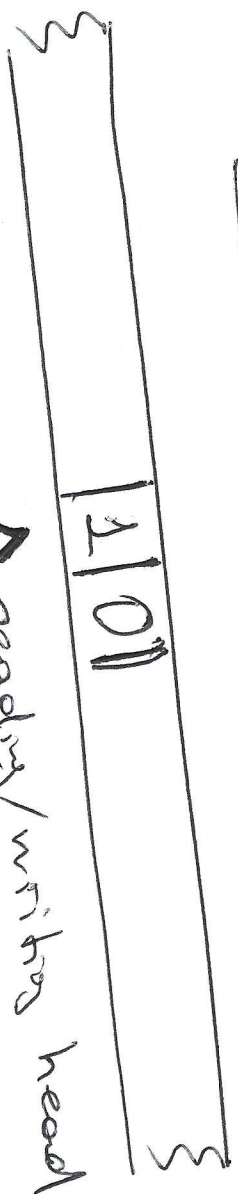
TSP (travelling SP)



SSSP (single source shortest)

Dijkstra ( $n \log n$ )

Turing Machine



reading/writing head

state

Alphabet for tape chars, } your choice  
Alphabet for state chars

TM  $n \log n \rightarrow C + n \log n$

equivalent? - yes

2-d numb 00-99

digits 0-9

Latin ch a-z } 22  
A-Z

TM program :

old  
^ old

-2-

Instruction: (old state) (old symbol) (new symbol) (dir) (new state)

B1 2 RC

←

1	1	1	1
---	---	---	---

→

2	0	1
---	---	---

^ B

X → n  
↓  
C

C O ~~1~~ L B

2	1
---	---

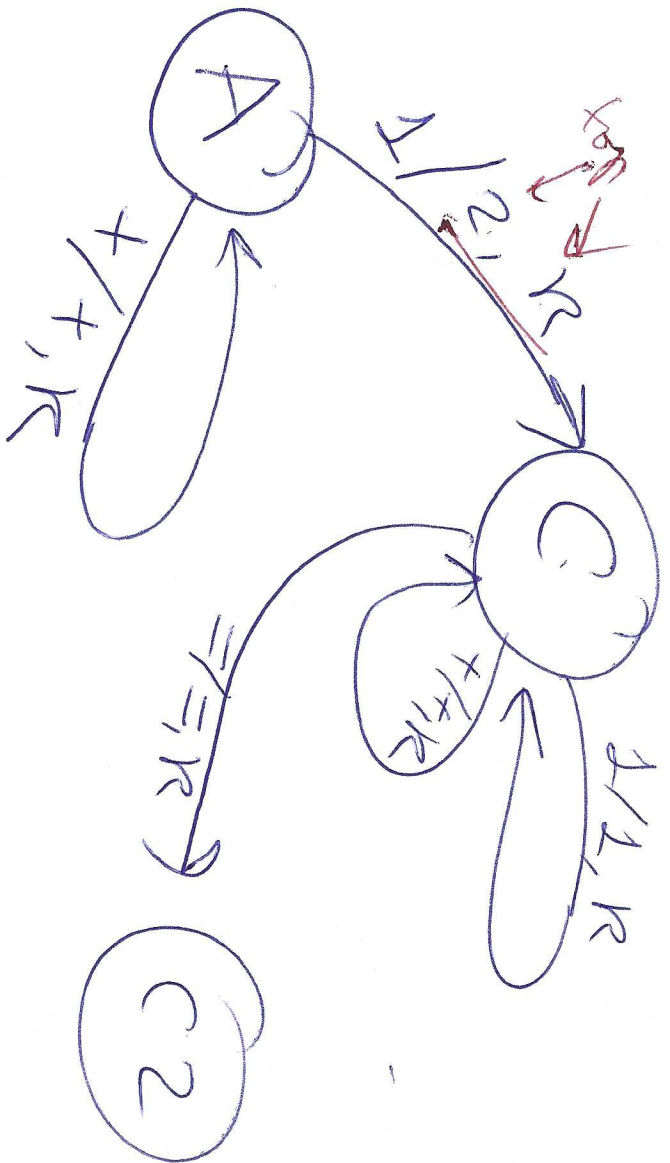
^ B

Extra features (convenience)

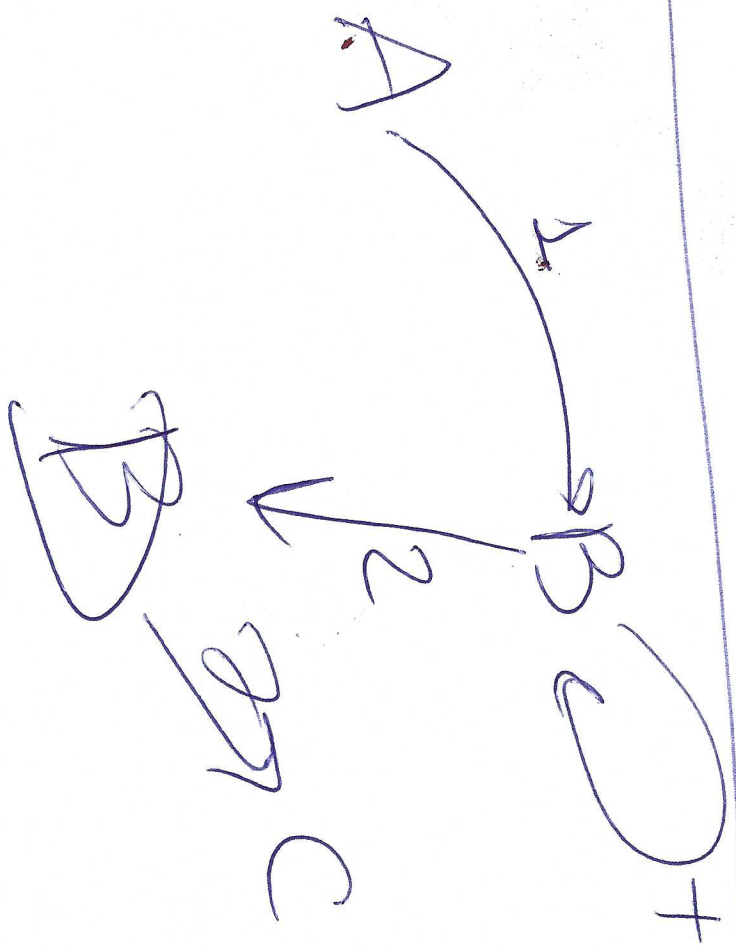
directs - strong

\* - ~~with~~ wild card ("B\*" →

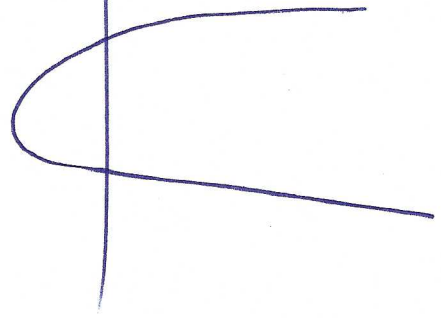
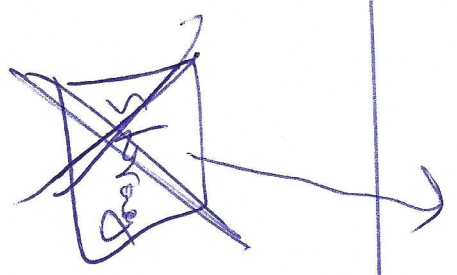
finite automata  
B0 =  
B1 =  
B2 =  
B3 =  
B4 =  
B5 =  
B6 =  
B7 =  
B8 =  
B9 =



~~FSM~~  
T M



FSM  
U  
RE



$n \log n, n^2, n^3, \dots$   
 polynomial

Dijkstra

$(\frac{3}{2})^n, 2^n, 5^n, n! - 4 -$   
 exponential

TSP  
 can TSP be solved  
 in polynomial.

P - class of problems  
 $P \in \exists \text{ DTM}$  that solves problem in polynomial time  
 deterministic

$\overline{NP}$  - class  
 $P \in NP \exists \overline{NTM}$  that solves problem in polynomial time

\* NTP allows multiple rules

{	B	1	2	R	C	-5-
	B	1	3	L	D	
	B	1	4	S	E	

\*\*)

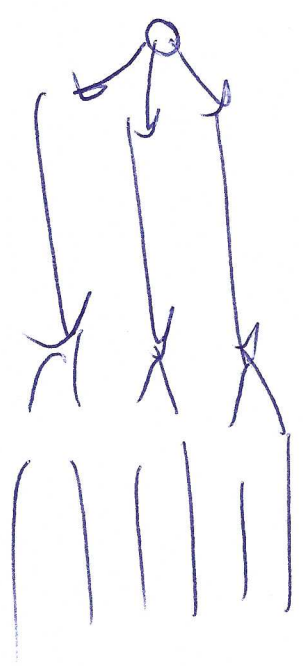




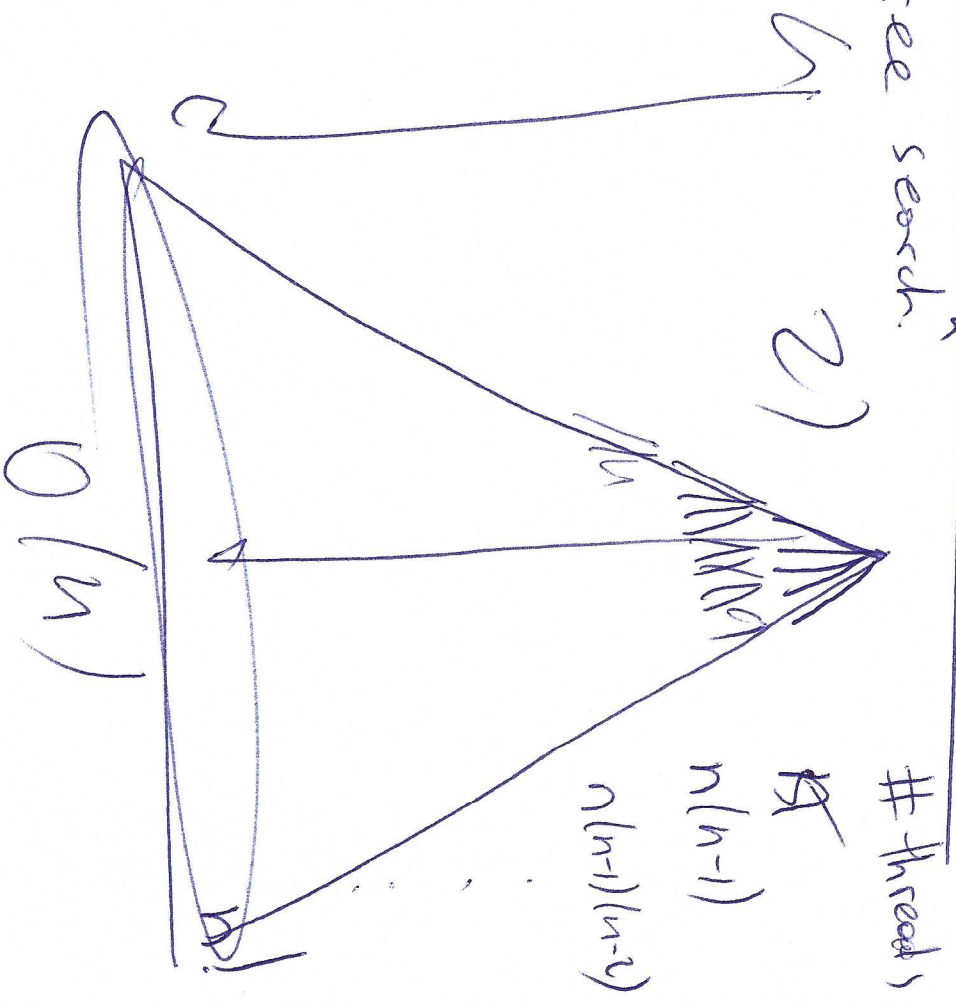
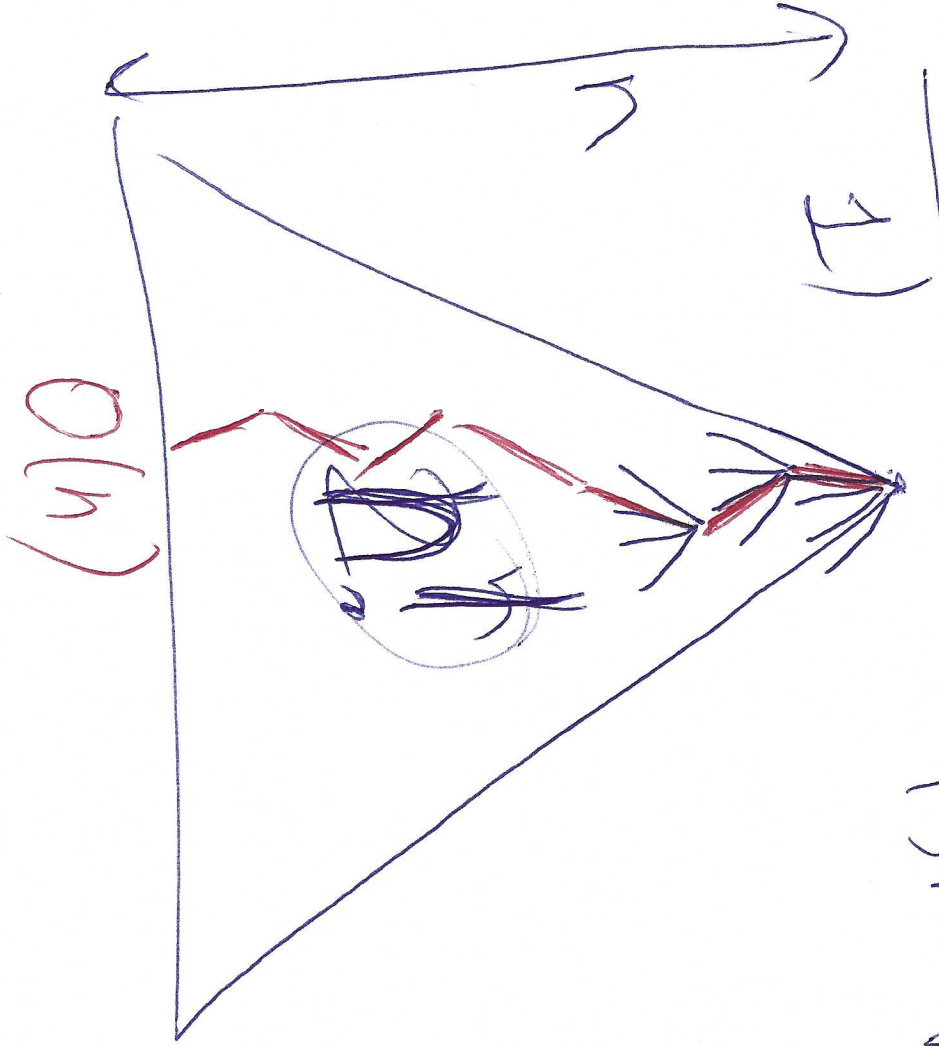
2 models of ~~NP~~ NP

1) ORACLE — "knows" which rule is best

2) <sup>arbitrary</sup> infinite multithreaded



TSP — "free search"

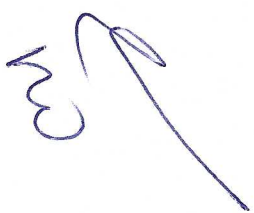
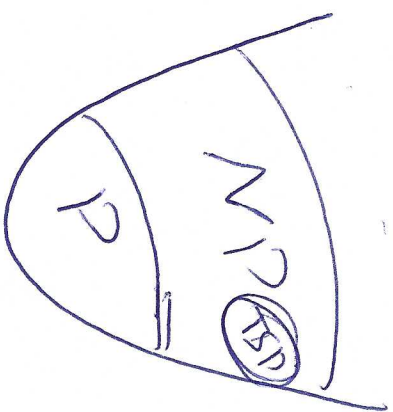


$DTM \subset NTM$

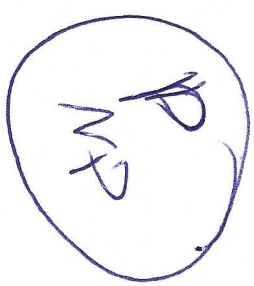
$P \subset NP$

Path finding? inf. field? —

TSP in poly normal time



Do Not Know




---

Sorting

using

merge

$\geq n \log n$

$n^2$

TSP

?

$P \stackrel{?}{=} NP$

$\$10^6$

~~people~~ publish

~~most~~ overlord

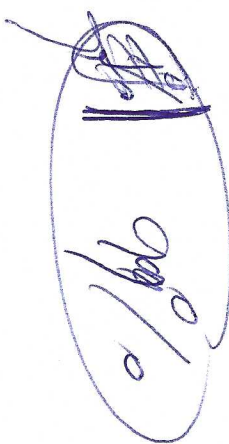
job security.

take  $10^6$ , be famous.

$(10^6)$

$2^n \rightarrow$

$n$



solvable

Renner  
Said  $10^6$