

CPSC 421/501, Dec 4, 2024

- Presentation, CPSC 501
- "Office Hours" rest of today and Dec 6

- T/F questions for
Ch 3, 7, 9

- Final exam:

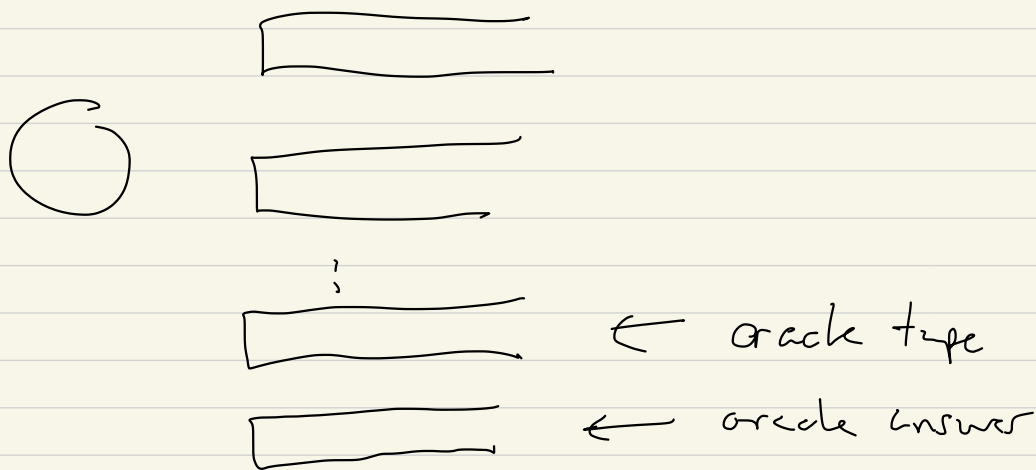
60 minute 1st part

15 minute break

60-70 minute 2nd part

7 pm, Dec 10 PWRM 1201

Didn't cover oracle in a
 strict sense!



Turing machine, M , with oracle

$$A: \quad A \in \Sigma_{\text{oracle}}^*$$

$$\Gamma \supset \Sigma, \Sigma_{\text{oracle}}, \{\sqcup\}, \{\top, \perp\}$$

Special state q_{query}

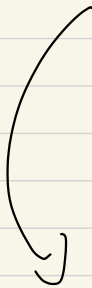
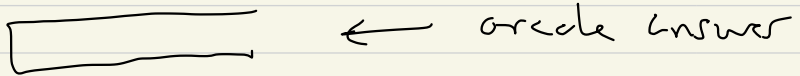
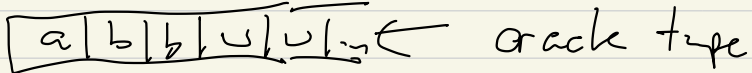
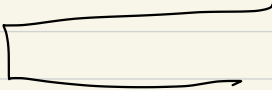
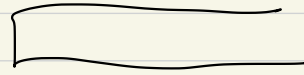
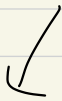


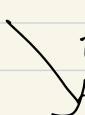
abb written on tape

q_{query}

true



false



if $abb \in A$

if $abb \notin A$

and it writes T/F on oracle answer tape

L is

- recognizable
- decidable
- decidable in poly time
- " " poly space
- " " $O(n^3)$ time

by a T.M. M with oracle A is

$$L = \{ w \mid M \text{ with oracle } A \text{ accepts } w \}$$

$$L = \{ w \mid M^A \text{ accepts } w \}$$

$P^A = (\text{Polynomial Time Decidable})^A$

$= \left\{ L \mid \begin{array}{l} \text{There is a poly time} \\ \text{oracle } A \text{ Turing machine,} \\ M^A, \text{ that decides } L \end{array} \right\}$

$NP^A =$
 $\sim \sim \sim \sim \sim$
 $\sim \sim$ non-deterministic
 $\sim \sim$

$=$
 $P^A = NP^A$ for some $A \subseteq \Sigma^*$,
 in particular if $A = \text{TQBF}$
 or any PSPACE-complete language

and $\exists B \subset \sum_B^*$ s.t.

$$P^B \neq NP^B$$

~~~~~ Class ends

PSPACE = Poly SPACE

$$DSPACE(f(n)) = SPACE(f(n))$$

↑

deterministic, vs

NSPACE(f(n))

$$P \stackrel{\text{def}}{=} \bigcup_{n \in \mathbb{N}} \text{TIME}(n^c)$$

~~n~~  $n \in \mathbb{N}$

or

DTIME

$$\text{TIME}(f(n)) \stackrel{\text{def}}{=} \text{DTIME}(f(n))$$

$\{ L \mid L \text{ is a language decidable by some T.m. in time } O(f(n)) \}$

NP --- WTIME( $n^c$ )

PSPACE . . . .

. . . Space . . .

Could write

P as PTIME

as

DP or DPTIME

↙  
deterministic

↖  
emphatically time