Nov 29. P^{SAT}, NP^{SAT} vs $SAT \in$ non-deterministic poly time

P^B, NP^B B = PSPACE-SNEAKY deterministic

(1) $P^{SAT} \stackrel{?}{=} NP^{SAT}$,

but having a SAT oracle $SAT \in NP$, non-det poly time

$\in$ PSPACE (deterministic)

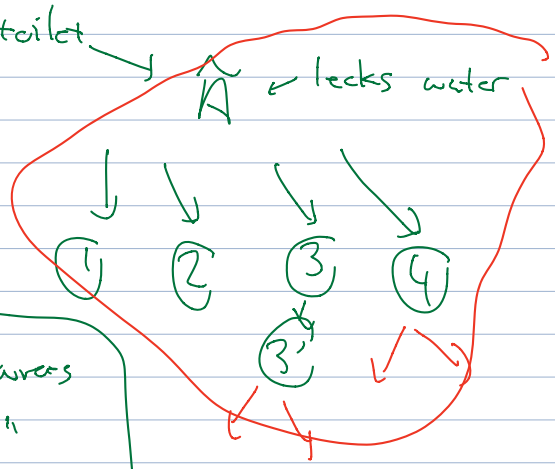
deterministic $\iff$ have a subroutine for it

=

$NP \subset P^{SAT}$, $coNP \subset P^{SAT}$

=

Long story:



Simulate A

per each call

(1) you have to go outside ← time resources ← patience "

(2) " " " " another toilet

(3) take toilet apart, look main gasket, replace, test

might need to replace bolts

(3') ← resource cost

knew this

(4) replace gasket & bolts & test

But ☹ I don't non-det do (1), (2), (3), (4), (5)

Difference: deterministic substitute for oracle call

non- " " " " " "

=

B = PSPACE-SNEAKY ∈ deterministic poly space

$P^B \subset NP^B \subset NPSPACE \subset PSPACE \subset P^{\text{oracle that is PSPACE complete}} = P^B$

Savitch's Thm

PSPACE

N

= non-det: see set up all possible many computation,

set up a Tm.

step 1

step 2

same thing

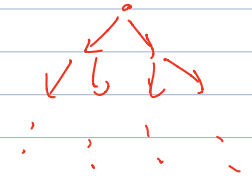
$\subseteq B$

$\subseteq B$

run det poly space alg

$\subseteq B$

$\subseteq B$



q_{acc} q_{rej} q_{acc}

=

HALT is undecidable (by Tm)

?

$HALT^A$ is undecidable (by Tm^A) for A = any given oracle ?

yes, this theorem relativizes

$TIME^B(n^3) \subsetneq TIME^B(n^{3.001})$

L_1, L_2 regular, decidable, poly time decidable, "space" → same is true

deterministic

L_1^* (dynamic programming)

(DFA → NFA)

$L_1 \cap L_2$

$L_1 \cup L_2$

⋮

L_1^{comp}

$L_1 \in NP$, is L_1^{comp} in NP ? Don't know

$L_1 \in NPSPACE$ is L_1^{comp} in NPSPACE ?

$PSPACE \subseteq NPSPACE$

deterministic