

For Ch 9 coverage (small) we want to have (or just know the existence of) a PSPACE-complete language.

(1) Could discuss 8.3 — TQBF PSPACE-complete

(2) PSPACE-SNEAKY is " "

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Start with:

$$\text{NP-SNEAKY} = \left\{ \langle M, w, \overbrace{||||||| \dots |}^{t \text{ times, i.e. } |t|} \right\} \left| \begin{array}{l} M \text{ accepts} \\ w \text{ within} \\ \text{time } t \end{array} \right.$$

\uparrow non-det T.M. \uparrow input \uparrow t

$$\text{NP-FAIL} = \left\{ \langle M, w, t \rangle \right\}$$

\uparrow binary, base 10

Rem: $|\langle M, w, |t| \rangle| = \text{larger than } \langle M \rangle + \langle w \rangle + t$

$|\langle M, w, t \rangle| = \text{roughly } \langle M \rangle + \langle w \rangle + \log_{10} t$

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$$\text{NP-SNEAKY} = \left\{ \langle M, w, \overbrace{||||||| \dots |}^{t \text{ times, i.e. } |t|} \right\} \left| \begin{array}{l} M \text{ accepts} \\ w \text{ within} \\ \text{time } t \end{array} \right.$$

Step 1: NP-SNEAKY \in NP :

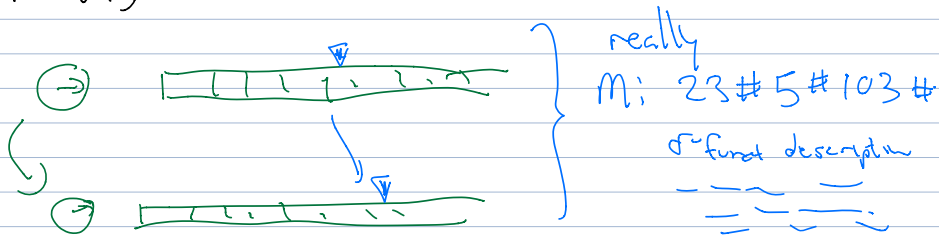
time i

Why? Algorithm: ① Set up w on a tape $\leftarrow |w|$

② For $i = 1$ to t (non-deterministically)

Compute one step of the T.m. transition

End for;



this loop done t times

roughly poly $\langle M \rangle$

$$\text{Cost } (|w| + t \langle M \rangle) \leftarrow (\text{for } 1\text{-tape to } t\text{-tape})$$

$$\leq \text{poly}(|K_M|, |K_w|, t = |t|)$$

Our definition of NP = non-det poly time

Really will need $t \cdot \langle M \rangle$

$$\text{poly}(\log_2 t + |K_M| + |K_w|)$$

is not enough

Explains: NP-SNEAKY \in NP (usually the easy part in SAT, 3color)

