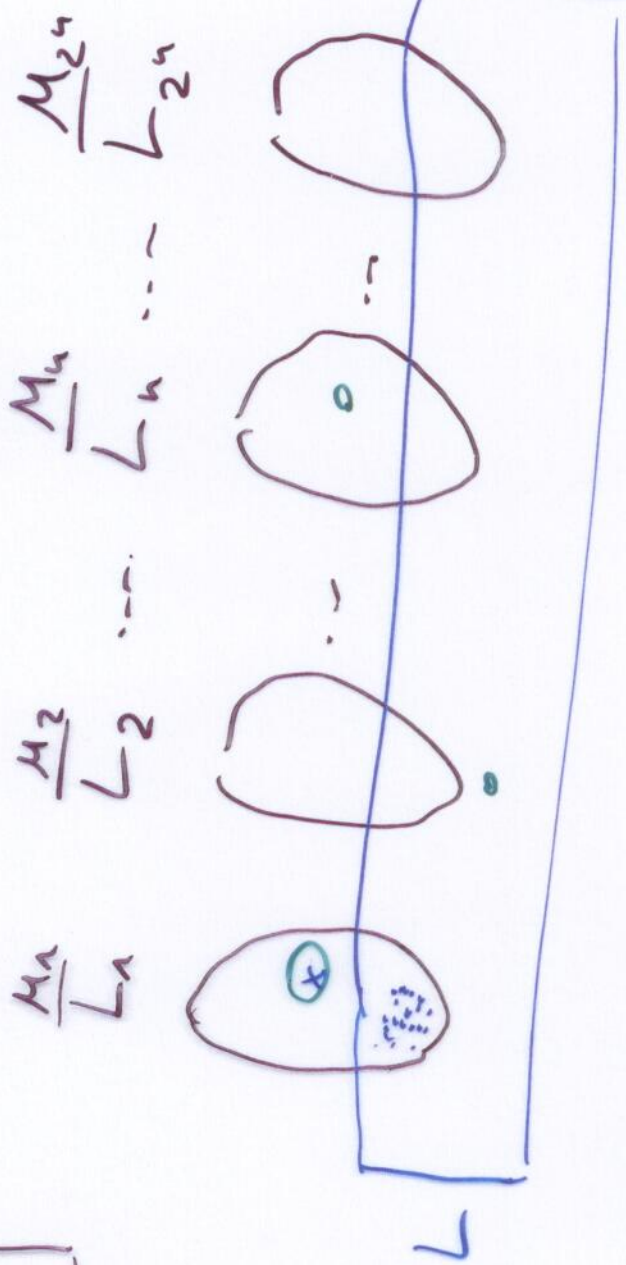


4



all languages
in \mathcal{P}
 M_i runs in time
 $O(n^i)$

11

Compute f

$i = 1; n = 1$

while (true) $n \leftarrow 2n$

$f(n) := n^i$

for each x with $|x| \leq \log n$

if $x \in M_i \Delta L$ then $i++$; break

$n++$

\in
 $x \in M_i \wedge x \notin L \dots n$
 $\vee x \notin M_i \wedge x \in L \dots n$

Running time of $f(n)$

n

n

$2n$

$\frac{O(n^3)}{\Rightarrow L \in NP}$

two cases

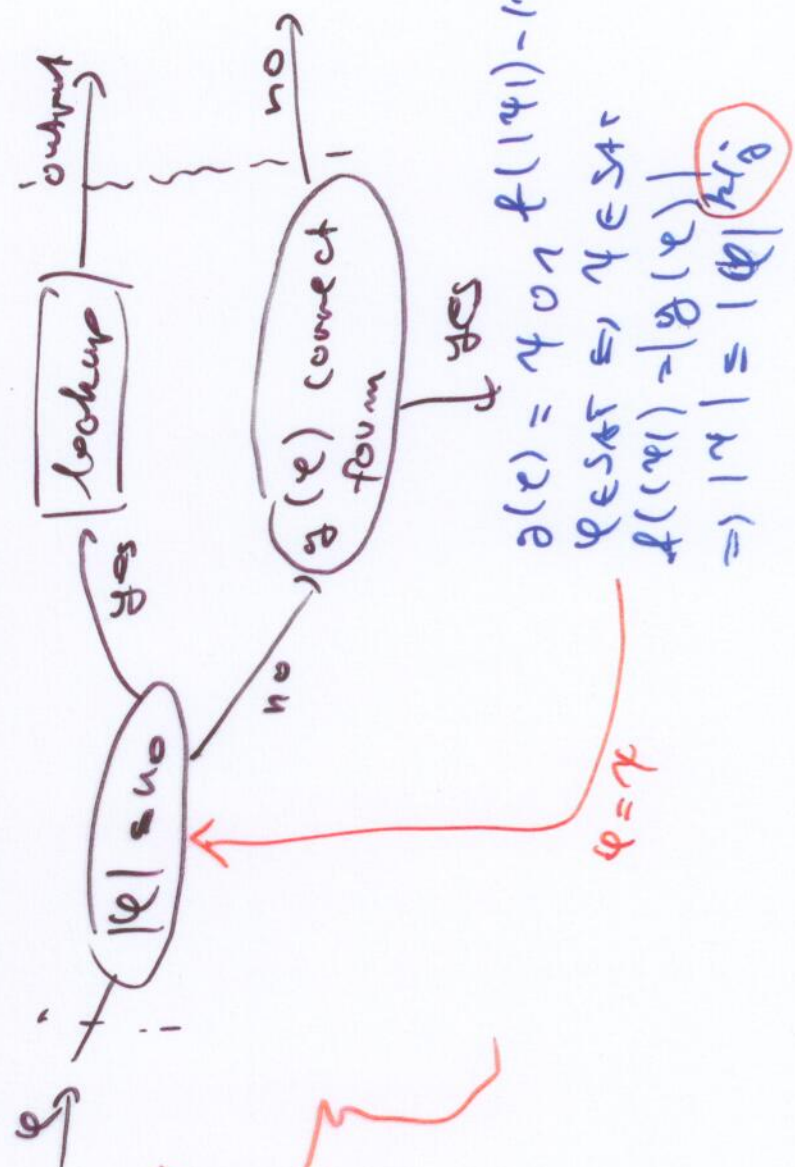
5. $i \in O(n)$
 $\in L \in P$
 $\Rightarrow SAT \in P$
 by a reduction

$\varphi \rightarrow \varphi_{O(f(n)-n-\gamma)}$

6. $i \rightarrow \infty (x)$

assume: L is NP-complete

$\Rightarrow \exists$ reduction g from SAT to L
 $g \in DTIME(n^k) \Leftrightarrow (x \in SAT \Leftrightarrow g(x) \in L)$
 $\Rightarrow \exists n_0 \forall n > n_0. f(n) = n^k$ for $k > k$
 $\Rightarrow \exists$ poly. alg. to decide SAT



$SAT \in P \Leftrightarrow \exists$

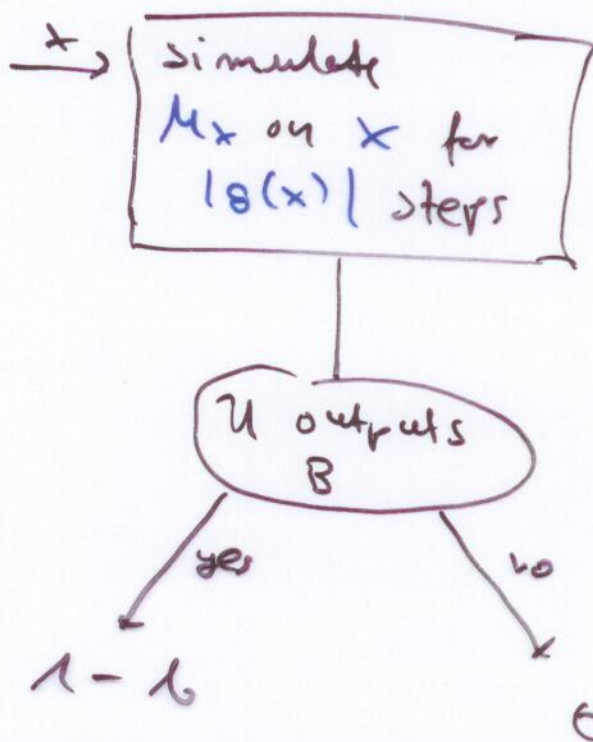
Det. Time Hierarchy

13

$$f \log f \in o(g)$$

$$\Rightarrow \exists n_0 \forall n \geq n_0 \cdot f(n) \log f(n) \leq g(n)$$

TM D



suppose \exists TM $M \in \text{DTIME}(f(n))$
 $\wedge L(M) = L(D)$

\Rightarrow choose x with $|x| \geq n_0$ s.t.
 $L(M_x) = L(M)$

$\Rightarrow L(M_x) \neq L(D)$