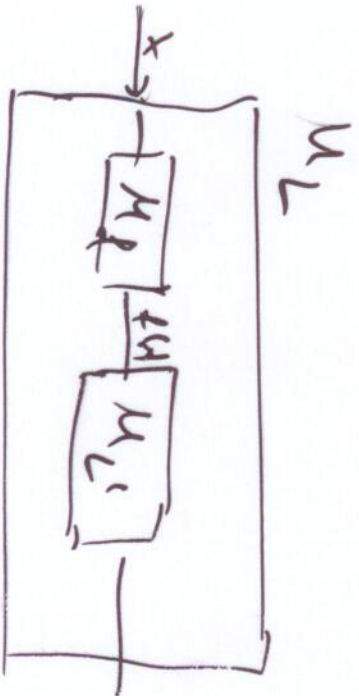
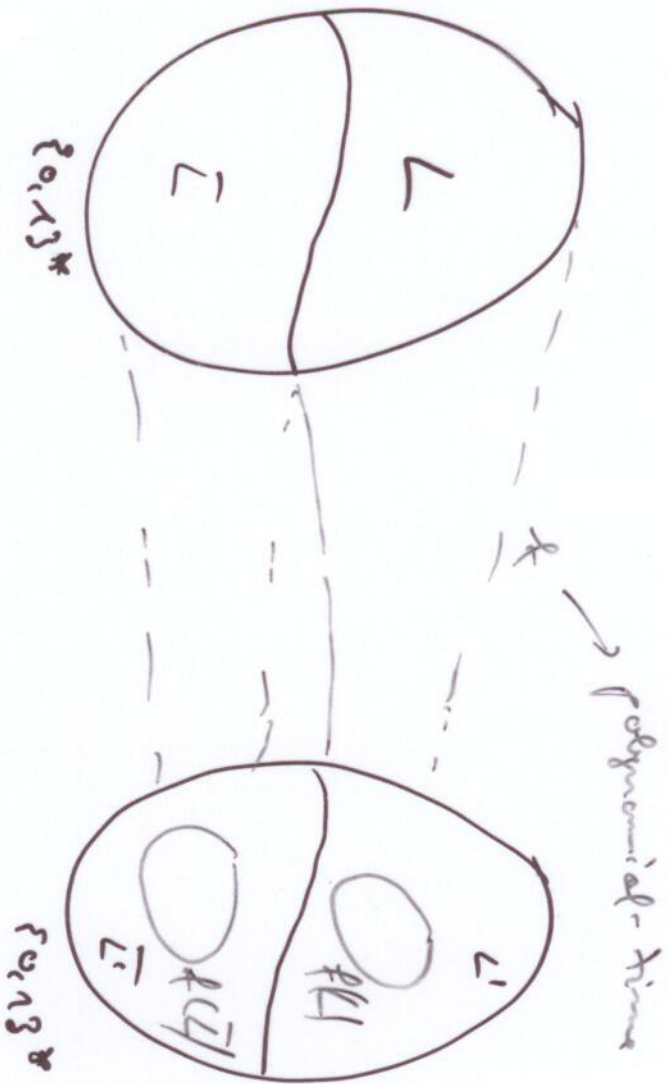


Reductions

$$L \leq_p L'$$



if  $x \in L$   
 if  $x \in L'$

1.21  $L \in NP$  iff  $L$  is verifiable

$\Rightarrow$   $\exists$  poly.  $q$   $M = (Q, \Sigma, \delta, q, \{0, 1\})$   $\exists$  polynomial  $p: \mathbb{N} \rightarrow \mathbb{N}$   
 $\forall x \in \{0, 1\}^*$   $\exists y \in \{0, 1\}^{p(|x|)}$  s.t.

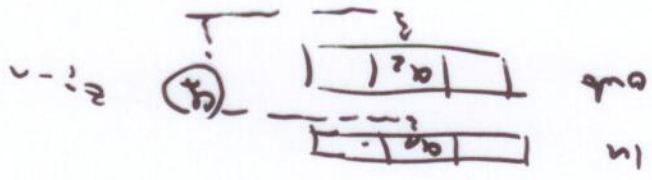
$$M(x, y) = 1 \Leftrightarrow x \in L$$

Show: reduction  $x \mapsto y$  s.t.  $x \in L \Leftrightarrow y$  satisfiable

Assume: a)  $M$  is oblivious and in time  $T$

b)  $M$  has two tapes

Snapshot of  $M$ :  $\langle q, a_1, a_2 \rangle = z$



Computation of  $M$  on  $\alpha, M$ :  $z_1, z_2, \dots, z_{T(n+p(n))}$   
 $|z_i|$  can be encoded by  $\odot$  bits depends  $|Q|, |\Gamma|$

$z_i$  depends on

$z_{i-1}$

$z$  inputpos (i)

$$y = x, n$$

inputpos (i) pos. of input head at step i

(i) - computed

pos. where the work head visited the next cell for the last time

$$\rightarrow F: \{0, 1\}^* \rightarrow \{0, 1\}^*$$

depends on  $\delta$

$y_1, \dots, y_n$  ...  $y_{n+p}$  input  
 $z_1, \dots, z_n$  ...  $z_{n+p}$  output  
 Input variables  $y_1, \dots, y_n$   
 Output variables  $z_1, \dots, z_n$   
 Transfer function  $Z(z)$