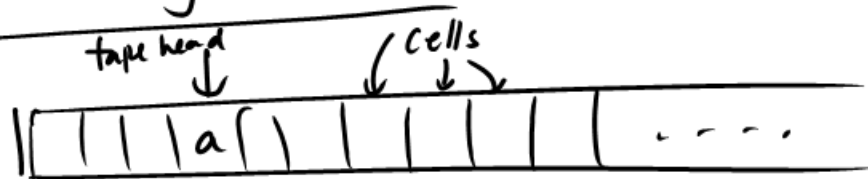


Turing Machines

*

A Turing machine:



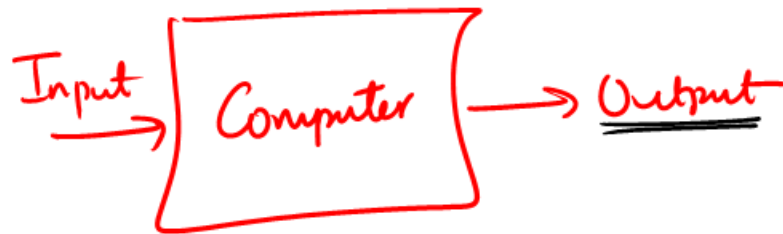
An infinite tape

- each cell can contain symbols from a finite alphabet Σ .



$$q \xrightarrow{a/b, R} q'$$

↑ reading ↑, replace a with b and move right



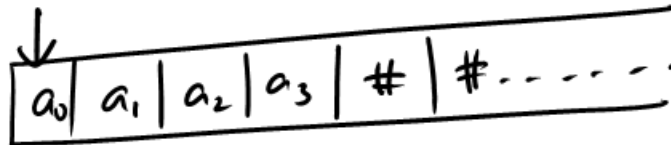
$$L \subseteq \Sigma^*$$

$$L = \left\{ \langle x^4 + xy = 9z, x^3 + y^3 = 9, \dots \rangle, \mid \right.$$

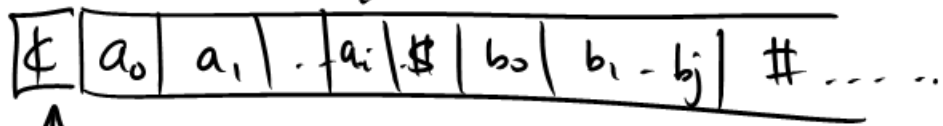
eq. has
an integral solution.

Turing machine's input

Initial
tape



$$L = \{ \phi w \$ \mid w \in \Sigma^* \}$$



$$a_0 = b_0; a_1 = b_1, \dots, i = j$$

$$\Sigma$$

$$\Gamma \geq \Sigma$$

- Go right reading ϕ .
- Read a_0 and remember it/replace $\#$
- Go right until you read a $\$$
- After reading $\$$, read b_0 and check $a_0 = b_0$.

$\phi/\phi, R$

$a/a, R \quad a \neq \$$

- Cross off the first character and remember what it was
- Move right till you see a #
- Read across crossed characters till you see a 'b'. Check if this was the letter you remembered.
Else reject.
- Cross off this character and replace it by x
- Move left part the # till you see an x.
- Move one position right.
- Repeat above till tape looks like $x \dots x \# x \dots x \#$