4/5/2019.

Defn: A turing machine is a 7-triple.
$M = (Q, \Sigma, \Gamma, \delta, q_0, q_{accept}, q_{reject})$

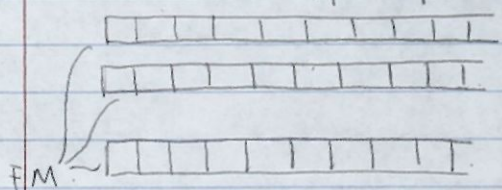
eg. NOPRIME = {integers $n \geq 0$ in binary which is not prime}
$= \{1, 4, 6, 8, 9, 10, 12, \ldots\}$.

(1) define $i = 2$. (when $n \neq i$).
(2) Divide the input n by i. if there is no reminder. → Accept
Otherwise. Set $i = i+1$ and repeat (2).
(3). if $n = i$, reject
TM does recognize noprime.

Defn: A turing machine decides A if for all $w \in \Sigma^n$.
{ M accepts $w \iff w \in A$.
M rejects $w \iff w \notin A$.

Multiple TM.

A TM is. multiple tape. ↙ input tape.



THM: A TM with multiple tapes. is equivalent to TM with 1 tape

Nondeterminism.

A non-deterministic TM is similar to a TM but at every step., the machine can proceed in multiple way simotinously.
" it can perform multiple branches. at the same time "

A power of S is P(S) = set of subsets of S.

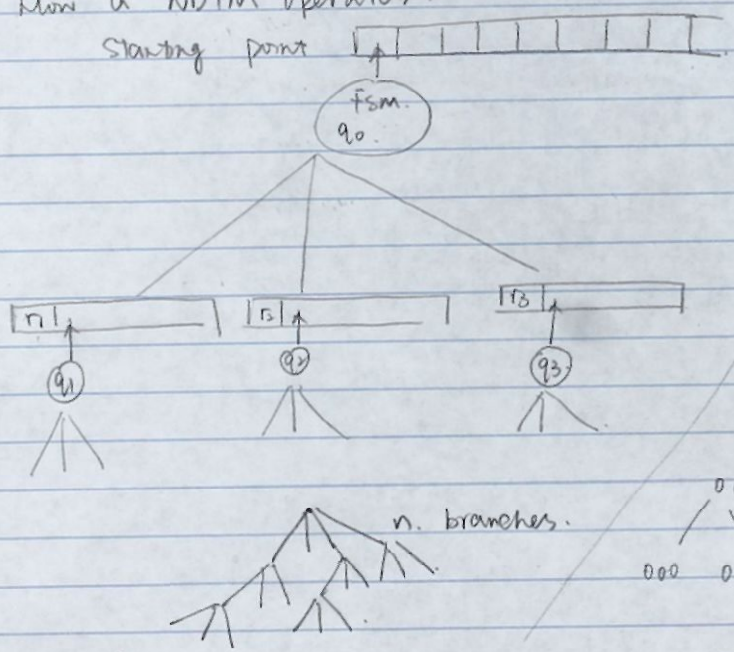
$$P(\{0,1,2\}) = \{\{\emptyset\}, \{0\}, \{1\}, \{2\}, \{0,1\}, \{0,1\}, \{1,2\}, \{1,2,3\}\}.$$

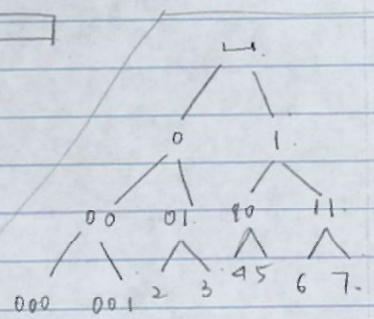
A non-deterministic TM (NDTM).

$$\delta : Q \times \Gamma \to P(Q \times \Gamma \times \{L, R\}).$$

$$(q, r) \to \{(q_1, r_2, L, R), (q_2, r_2, L, R), \{q_n, r_n, L, R\}\}$$

eg. How a NDTM operates.





eg NOPRIME

(1) Let $i = 2$ (2) for each possibility, divide n by the corresponding integer, if it divides, accept. Otherwise set $i = i+1$, repeat step 2.