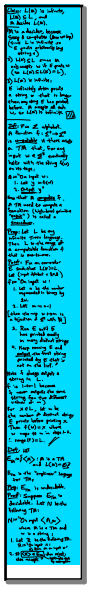

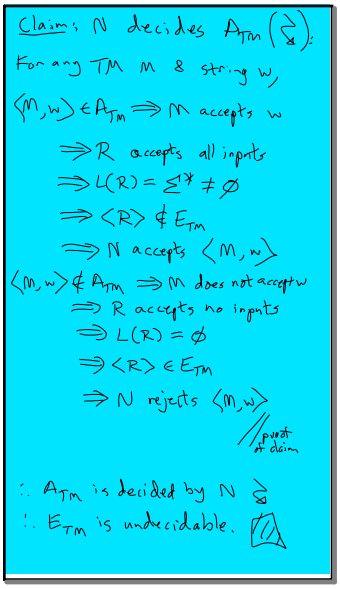
Claim: N decides A_{TM} ($\leq$).
For any TM M & string w,
$\langle M,w\rangle \in A_{TM} \Rightarrow$ M accepts w
$\Rightarrow$ R accepts all inputs
$\Rightarrow L(R) = \Sigma^* \neq \emptyset$
$\Rightarrow \langle R\rangle \notin E_{TM}$
$\Rightarrow$ N accepts $\langle M,w\rangle$
$\langle M,w\rangle \notin A_{TM} \Rightarrow$ M does not accept w
$\Rightarrow$ R accepts no inputs
$\Rightarrow L(R) = \emptyset$
$\Rightarrow \langle R\rangle \in E_{TM}$
$\Rightarrow$ N rejects $\langle M,w\rangle$
// proof of claim
$\therefore A_{TM}$ is decided by N $\lightning$
$\therefore E_{TM}$ is undecidable.