1. Prove that $\text{Accept}_1$ defined by

$$\text{Accept}_1(M', w) \iff M(w) \text{ accepts}$$

is undecidable.

2. Give a many-one reduction from $\text{Halt}_0$ to $\text{Halt}_1$.

\[ w \mapsto <w, \varepsilon>. \quad w \in \text{Halt}_0 \iff <w, \varepsilon> \in \text{Halt}_1 \]

Both mean $M'\! (\!M\!) \text{ halts}$

where $w = \!M\!'$.  

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Want a function $f$ (many-one reductio)

\[ f : \!M' \mapsto \!N' \]

such that $\!M'$ halts if $\!N'$ accepts.

So $f$ is a many-one reductio from $\text{Halt}_0$ to $\text{Accept}_1$.

$\!N'$ is formed from $\!M'$ by replacing any instruction in $\!N'$ that rejects, by an instruction that accepts and halts.

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Universal Algorithm:

If either of these accept, then accept.