CPSC 351 — Tutorial Exercise #13
Hint for the Problem in This Exercise

1. Let $\text{Reject}_{\text{TM}} \subseteq \text{TM+I} \subseteq \Sigma_{\text{TM}}^\star$ be the set of encodings of Turing machines

$$M = (Q, \Sigma, \Gamma, \delta, q_0, q_{\text{accept}}, q_{\text{reject}})$$

and strings $\omega \in \Sigma^\star$ such that M ***rejects*** ω.

You were asked to use a ***many-one reduction*** to prove that the language $\text{Reject}_{\text{TM}}$ is undecidable.

Hint: Let $M = (Q, \Sigma, \Gamma, \delta, q_0, q_{\text{accept}}, q_{\text{reject}})$ be a Turing machine. How could you make a *very simple* change, in order to produce another Turing machine

$$\widehat{M} = (Q, \Sigma, \Gamma, \widehat{\delta}, q_0, q_{\text{accept}}, q_{\text{reject}})$$

such that M rejects ω if and only if $\widehat{M}$ ***accepts*** ω, for *every* string $\omega \in \Sigma^\star$?