Example

\[ L_E = \{ \langle M \rangle : \text{M accepts } \varepsilon \} = \{ \langle M \rangle : \langle M, \varepsilon \rangle \} = I \{ L : \varepsilon \in L \} \]

Hence Undeniable.

Is c.e.: Just run

\[ I = \{ \langle M \rangle : \text{L(M) = } \{ \varepsilon \} \} \]

Mu on \( \langle M, \varepsilon \rangle \).

(IE)

i.e. M accepts \( \varepsilon \)

but does not accept any other string.

Index set of the class containing only \( \{ \varepsilon \} \).

\( \text{Atm} \leq_m I \).: Undeniable, but let's see the reduction.

\[ <M, W> \not\in M' \]

(Does also show)

\( \text{Atm} \leq_m L_E \)

\( \text{M accepts } W \Rightarrow L(M') = \{ \varepsilon \} \) i.e. \( M' \) only accept \( \varepsilon \).

Otherwise \( M' \) doesn't only accept \( \varepsilon \).

\( \text{IIE is not c.e.:} \)

Show \( \text{Dtm} \leq_m I\text{IE} \) as well.
Delay Trick

\[ M \xrightarrow{g} M'' \]

- If \( X = \varepsilon \), accept
- Run \( M(\langle M \rangle) \) for up to \( n \) steps
  - If it accepted, accept \( X \).
  - If \( M \) does not accept \( \langle M \rangle \) \( \Rightarrow \) \( \text{L}(M'') \neq \{ \varepsilon \} \), accept \( \varepsilon \).

Does this give

\[ M' = D_m \leq I \]

If not, use a busy box?

Checking Computations: An EQ of a 1 tape TM \( M \) during a computation on input \( X \) is

\[ I = \langle g, w, i > \in \text{state, tape contents} \]

\[ T(M, X, i) : i \] is a sequence of IPs (1 \( \leq \) \( n \) \( \leq \) \( m \))

\[ I_0, I_1, \ldots, I_t \text{ s.t. } I_0 = \langle s, X, 1 \rangle \text{ input } x \]

and for all \( j \geq 1 \), \( I_j \) follows from \( I_{j-1} \) via the simulate in linear time!

One can also write

\[ I = U g CV \text{ where } W = UCV \text{ and } M \text{ is scanning } C. \]

Or \( I = U [g]^c ) \text{ cell } i \)