- We proved the following in previous lectures -

  L_d is not a TRL, $\overline{L_d}$ is an undecidable TRL

  L_u is an undecidable TRL.

  since L_u is an undecidable TRL, $\overline{L_u}$ is not a TRL

- $L_u \leq_m L_{halt}$

  $f(< M, w >) =< M', w >$, where M' is same as M except that M' loops when M reaches reject state

  hence, L_{halt} is undecidable

  however, we proved that L_{halt} is a TRL via constructing a UTM

  since L_{halt} is an undecidable TRL, $\overline{L_{halt}}$ is not a TRL

- $L_u \leq_m L_{equal}$

  $f(< M, w >) =< M_1, M_2 >$, where

  M_1: on input w' accept w'

  M_2: on input w'', if M accepts w, accept w''

  hence, L_{equal} is undecidable

- $L_u \leq_m L_{regular}$

  $f(< M, w >) =< M' >$, where

  M': on input w'

  if $w' \in \{0^i 1^i | i \geq 0\}$ accept w'

  else if M accepts w accept w'

  hence, $L_{regular}$ is undecidable

- $\overline{L_u} \leq_m L_{finite}$

  $f(< M, w >) =< M' >$, where

  M': on input w'

  if M accepts w accept w'

  hence, L_{finite} is not a TRL

- $\overline{L_u} \leq_m L_{empty}$

  $f(< M, w >) =< M' >$, where

M': on input w'

if M accepts w accept w'

hence, L_{empty} is not a TRL

- $L_{empty} \leq_m L_{equal}$

  $f(< M >) =< M, M' >$, where

  M': on input w'

  reject w'

  hence, L_{equal} is not a TRL

- since $L_u \leq_m L_{equal}$ (see above), $\overline{L_u} \leq_m \overline{L_{equal}}$

  hence, $\overline{L_{equal}}$ is not a TRL