Problem 5:

$A_{TM} = \{<M, \omega> | M \text{ accepts } \omega\}$
  ↓ undecidable

Construct M' such that on input string s
→ simulate M on input ω
→ accept all inputs x if M ever accepts ω
→ if M never accepts ω s, accept x if $x \in \{0^n 1^n | n \geq 0\}$

  ↓ If M accepts ω, $L(M')$ is regular (Σ^*)
   Otherwise it's not.
   $<M, \omega> \in A_{TM} \iff <M'> \in REGULAR_{TM}$

Assume a decider D exists for $REGULAR_{TM}$,
$\Rightarrow$ a decider must also exist for A_{TM}

∴ There's a contradiction, $REGULAR_{TM}$ is undecidable