Prop: Let L be a language. If L & $\overline{L}$ are both T-rec, then L is decidable.

Proof: Let M_1 & M_2 be TMs such that $L(M_1) = L$ & $L(M_2) = \overline{L}$. Let

$D :=$ "On input w:
  1. Run M_1 & M_2 in tandem on input w until one of them accepts.
  2. If M_1 accepts, then accept; else reject"

D decides L:
  exactly one of M_1 & M_2 accepts w, so D halts & does the right thing. //

Cor: $\overline{A_{TM}}$ is not T-rec. //