

Unsolvable Problems

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Quine

Defn. A program that reproduces its own source code.

Any program can be augmented to include a method
mySource() that prints out the program's source code

Learning about a string

→ Let M be recognizer

→ Have string w , want to know if $w \in L(M)$

1. Run M on w

→ accept or reject ✓

→ but - could loop

2. Check if $\langle M, w \rangle \in A_{TM}$

→ Run U_{TM} on $\langle M, w \rangle$

→ still can loop

3. Build decider for A_{TM}

→ This cannot exist: try it on itself,
we can create a case where if
it rejects it must accept (paradox)

Therefore: R is undecidable

$R \neq RE$, because $A_{TM} \notin R$ but $A_{TM} \in RE$