

Problem: FOL undecidable

## decidable subsets

propositional logic: RAINS  $\Rightarrow$  Pours

pred calculus w/ monadic predicates

prefix classes:  $\exists * \forall * \psi$

regular expressions for FOL

Relational calculus w/ binary relations & is undecidable

Provers don't fail usefully

why  $\neg TP$ ?

- most Thms false
- true Thms still usually don't terminate

"anything is possible, but nothing is easy" - Moore

## THEOREM PROVER?

## Model Finding

statement  $S$

variables

assignment  $var \rightarrow val$

$\mathcal{L}$  is a 'model' iff

$S$  holds for that ass.

Valid: all assignments are models

invalid: some ass not a model  
(counter example)

ex: MACE

$$e * x = x$$

ask  $S \in M?$

$$g(x) * x = e$$

$$(x * y) * z = x * (y * z)$$

$$a * b \neq b * a$$

## Model Checking

model: state machine  $M$  (finite)

statement: property  $P$

$$AG \neg (GreenNS \wedge GreenWE)$$

ask if  $M$  is a model of  $P$

problem: models finite but huge  
"state explosion problem"

$$\#(M_1 \parallel M_2) = \#M_1 \times \#M_2$$