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## CS206 Tutorial No. #8

Date: Mar 24, 2006

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1. Prove that any satisfiable predicate logic formula has a countable model.
2. Check the unsatisfiability of following formulae using Herbrand's Theorem.

$$\begin{aligned} 1 \quad & \exists(x)[P(x) \wedge Q(x)] \\ & \forall(x)[P(x) \rightarrow R(x)] \\ & \forall(x)[Q(x) \rightarrow S(x)] \\ & \neg\exists(x)[P(x) \wedge S(x)] \end{aligned}$$

$$\begin{aligned} 2 \quad & \forall(x)[\exists(y)[x = F(y)]] \\ & \forall(x)[G(F(x)) = x] \\ & \exists(x)[\forall(y)[\neg(x = G(y))]] \end{aligned}$$

Method:

- (a) Convert to Prenex Normal Form.
- (b) Convert to Skolem Normal Form.
- (c) Find Herbrand Universe.
- (d) See if there is a finite collection of ground clauses that is propositionally unsatisfiable.