Assignment 1

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1. Convert the FOL into CNF

$\forall x [\exists z \text{ Animal}(z) \wedge \text{Kills}(x,z)] \Rightarrow [\forall y \neg \text{Loves}(y,x)]$

(i) Eliminate implications:

$\forall x [\neg \exists z \neg \text{Animal}(z) \vee \text{Kills}(x,z)] \vee [\forall y \neg \text{Loves}(y,x)]$

(ii) Move $\neg$ inwards

$\forall x [\forall z \text{ Animal}(z) \wedge \neg \text{Kills}(x,z)] \vee [\forall y \neg \text{Loves}(y,x)]$

(iii) Change quantifier

$\forall x [\forall z \text{ Animal}(z) \wedge \neg \text{kills}(x,z)] \forall [\forall z \neg \text{Loves}(z,x)]$

(iv) Skolemization

$\forall x [\text{Animal}(f(x)) \wedge \neg \text{kills}(x, f(x))] \vee \neg \text{loves}(g(x), x)$

(v) Drop Universal Quantifier

$[\text{Animal}(f(x)) \wedge \neg \text{kills}(x, f(x))] \vee \neg \text{loves}(g(x), x)$

(vi) Distribute $\vee$ over $\wedge$

$[\text{Animal}(f(x)) \vee \neg \text{loves}(g(x), x)] \wedge [\neg \text{kills}(x, f(x)) \vee \neg \text{loves}(g(x), x)]$

2. Convert the sentences into FOL and prove the query using resolution

Rules:-

Cold and precipitation → snow

January → cold

Clouds → precipitation

Facts:-

January, Clouds

Prove snow

→ Cold and precipitation → Snow

¬ Cold ∨ ¬ precipitation → ∨ Snow

January → cold

¬ January ∨ cold

Clouds → precipitation

¬ Clouds ∨ precipitation