

AI Assignment - 1

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1. Convert the following FOL into CNF

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

Ans.

$$\begin{aligned} & \forall x [\neg \exists z \neg \{ (\text{Animal}(z) \wedge \text{Kills}(x, z)) \}] \vee [\forall y \neg \text{Loves}(y, x)] \\ & \forall x [\neg \exists z \neg \text{Animal}(z) \vee \neg \text{Kills}(x, z)] \vee [\forall y \neg \text{Loves}(y, x)] \\ & \forall x [\forall z \neg \text{Animal}(z) \vee \neg \text{Kills}(x, z)] \vee [\forall y \neg \text{Loves}(y, x)] \\ & \forall x \forall y \forall z [\neg \text{Animal}(z) \vee \neg \text{Kills}(x, z)] \vee [\neg \text{Loves}(y, x)] \\ & \forall x [\neg \text{Animal}(G(x)) \vee \neg \text{Kills}(x, G(x))] \vee [\neg \text{Loves}(F(x), x)] \\ & [\neg \text{Animal}(G(x)) \vee \neg \text{Kills}(x, G(x))] \vee [\neg \text{Loves}(F(x), x)] \\ & [\neg \text{Animal}(G(x)) \vee \neg \text{Loves}(F(x), x)] \vee [\neg \text{Kills}(x, G(x)) \vee \neg \text{Loves}(F(x), x)] \end{aligned}$$

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

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i) Cold & precipitation \rightarrow snow

$$\text{Cold}(x) \wedge \text{precipitation}(x) \Rightarrow \text{snow}(x)$$

$$\neg (\text{Cold}(x) \wedge \text{precipitation}(x)) \vee \text{snow}(x)$$

$$\neg \text{Cold}(x) \vee \neg \text{precipitation}(x) \vee \text{snow}(x)$$

ii) January \rightarrow Cold

$$\text{January}(x) \Rightarrow \text{Cold}$$

$$\neg \text{January}(x) \vee \text{Cold}(x)$$

iii) Clouds \rightarrow precipitation

$$\text{clouds}(x) \Rightarrow \text{precipitation}(x)$$

$$\neg \text{clouds}(x) \vee \text{precipitation}(x)$$

iv) January(x)

v) Clouds(x)

To prove :-

$$\text{snow}(x)$$

\rightarrow Resolution of i) and ii)

$$\text{vi) } \neg \text{precipitation} \vee \text{snow}(x) \vee \neg \text{January}(x)$$

\rightarrow Resolution of vi) and iv)

$$\text{vii) } \neg \text{Precipitation}(x) \vee \text{snow}(x)$$

\rightarrow Resolution of vii) and iii)

$$\text{viii) } \neg \text{snow}(x) \vee \neg \text{clouds}(x)$$

\rightarrow Resolution of viii) and v)

$$\text{snow}(x)$$

Hence Proved