

CLAUSE FORM CONVERSION, RESOLUTION

Introduction:

Clause Form Conversion:

Clause form is a standard way to represent logical formulas in first-order logic. A formula is in clause form if it is a disjunction (OR) of one or more conjunctions (AND), where each conjunction is a set of literals (positive or negated atomic propositions). The process of converting a formula into clause form involves applying various transformations to eliminate implications and quantifiers.

Here are the key steps for converting a formula into clause form:

1. Eliminate Implications:

- Replace implications (\rightarrow) with their equivalent disjunction form.

$$(P \rightarrow Q) \equiv (\neg P \vee Q)$$

2. Move Negations Inwards (De Morgan's Laws):

- Apply De Morgan's laws to move negations inward.

$$\neg(P \wedge Q) \equiv (\neg P \vee \neg Q)$$

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3. Skolemization:

- Eliminate existential quantifiers by introducing Skolem functions.

$$\exists x P(x) \Rightarrow P(c) \text{ (where 'c' is a constant)}$$

4. Standardize Variables:

- Rename variables to avoid naming conflicts.

5. Drop Universal Quantifiers:

- Remove universal quantifiers, as they are implicit in clause form.

The result is a formula in conjunctive normal form (CNF), where each clause is a disjunction of literals.

