Predicate Calculus

Alphabet:
Constants: a, b, c, d
Variables: x, y, w, z
Functors: f, g, h
Predicates: p, q, r
Connectives: ∨, ∧, →, ¬
Quantifiers: ∀, ∃

Terms:
The least set satisfying the properties:
1) Constants and variables are terms.
2) If t₁, t₂, . . . , tₖ are terms and f is k-argument functor, then f(t₁, t₂, . . . , tₖ) is a term.
Example: *(+x,2,y) is a term. It can be also written as ((x+2)*y).

Formulas:
The least set satisfying the properties:
1. t₁, t₂, . . . , tₖ are terms and p is k-argument predicate, then p(t₁, t₂, . . . , tₖ) is a
   formula (called atomic formulas).
2. if α, β are formulas, then (α ∨ β), (α ∧ β), (α → β), ¬α are formulas.
3. if α(x) is a formula, then (∀x)α(x), (∃x)α(x) are formulas.

Control Strategies for Resolution Methods

Resolution is an important rule of inference that can be applied to a certain class of well
formed formulas (wffs) called clauses. A clause is defined as a wff consisting of a
disjunction of literals. Literal is defined as atomic formula or its negation. The resolution
process, when it is applicable, is applied to a pair of parent clauses to produce a derived
clause.

Process of converting any predicate calculus wff to a set of clauses:
1) Eliminate implication symbols.
2) Reduce scopes of negation symbols (negation symbol can be applied to at most
   one atomic formula)
3) Standardize variables
4) Eliminate existential quantifiers
5) Convert to prenex form (Skolemization)
6) Convert to conjunctive normal form
7) Eliminate universal quantifiers
8) Eliminate ∧ symbol
9) Rename variables

Example: (∀x)[P(x) ⇒ ((∀y)(P(y) ⇒ P(f(x,y))))] ∧ (∀y)[Q(x,y) ⇒ P(y)]].