CMSC 471/671 | **Artificial Intelligence** | Fall 2000
Section 0101 | TuTh 5:30 - 6:45pm | MP103

Homework 4

Due November 21, 2000

1. Convert the following FOL sentences to clause form
   a) ∃x∀y [P(x, y) ^ Q(x, y) => R(x)]
   b) ∀x [~Clear(x) => ∃y On(y, x)]
   c) ∀x [P(x) => Q(x) ^ R(x)]
   d) ∃x [~(P(x) ^ Q(x)) => R(x)]
2. Unify the argument lists of each of the following pairs of opposite literals (i.e., find their most general unifier *q*)
   a) P(f(x)) and ~P(y)
   b) P(x, a, y) and ~P(z, z, b)
   c) P(x, f(x)) and ~P(a, y)
3. Explain why the following pairs of opposite literals are not unifiable
   a) P(x, x) and ~P(a, b)
   b) Ancestor(x, son(x)) and ~Ancestor(Bill, George)
   c) P(f(x), x) and ~P(y, y)
4. Use resolution refutation to prove that

   ∃x [I(x) ^ ~R(x)]

   is a logical consequence of the following set of axioms

   A1: (~R(x), L(x))

   A2: (~D(x), ~L(x))

   A3: (D(sk_1))

   A4: (I(sk_1))

   where sk_1 is a skolem constant

   [Hint: Convert the negation of the theorem to clause form first and then try to derive the null clause by resolution.]