Advanced Data Modeling

Summer Semester 2008
- Exercises IV -

*To be handed in before **2008-05-26, 23:59** via e-mail to sschenk@uni-koblenz.de, subject line: [ADM] ...*

1) Instances, Variants and Substitutions
   1. Suppose Θ_1 and Θ_2 are substitutions and there exist substitutions σ_1 and σ_2, such that $\Theta_1 = \Theta_2\,\sigma_1$ and $\Theta_2 = \Theta_1\,\sigma_2$. Show that there exists a variable-pure substitution γ, such that $\Theta_1 = \Theta_2\gamma$.

   2. Which of the following clauses are Instances or Variants of each other?
      1. p(x, y, z) :- q(x, y), r(f(z))
      2. p(x, b, f(z)) :- q(x, b), r(f(f(z)))
      3. p(v, w, f(z)) :- q(v, b), r(f(f(z)))
      4. p(z, w, v) :- q(z, w), r(f(v))
      5. p(f(x), y, f(z)) :- q(f(x), y), r(f(f(z)))
      6. p(f(x), y, z) :- q(f(x), y), r(f(z))

2) The following Lemma shows that we only need to deal with Herbrand interpretations in order to find a model for any logic program:

   Let C be a set of clauses and Σ be any signature containing all symbols used in C. The grounding of C with respect to Σ, denoted C^* is the set of all ground instances of the signature Σ of clauses in C. Let I be a Herbrand interpretation and C be a set of clauses.

   Prove that I |= C if and only if I |= C^*.

3) Program Completion
   1. Let the definition of a predicate symbol p be

      p(y) :- q(y), not r(a,y).
      p(f(z)) :- not q(z).
      p(b).

      Give a completion of p.

   2. Let P be a normal program and comp(P) it's completion. Prove that P is a logical consequence of comp(P). Hint: P is a logical consequence of comp(P) if
      I |= comp(P) $\rightarrow$ I |= P