## LGIC 010 & PHIL 005 Problem Set 6 Spring Term, 2010

We say that a schema S admits a positive natural number n if and only if there is a structure A of size n which satisfies S. (Recall that the size of a structure is the number of members of its universe of discourse.)

1. (25 points) Write down a schema S involving only the dyadic predicate letter "R," and the identity predicate such that S admits n if and only if n is even, and S implies

$$(\forall x) \neg Rxx \land (\forall x)(\forall y)(Rxy \supset Ryx).$$

2. (25 points) Write down a schema S involving only the dyadic predicate letter "R," and the identity predicate such that S admits n if and only if n is divisible by three, and S implies

$$(\forall x) \neg Rxx \land (\forall x)(\forall y)(Rxy \supset Ryx).$$

3. (25 points) Write down a schema S involving only the dyadic predicate letter "R," the monadic predicate letter "P," and the identity predicate such that S admits n if and only if n is even, and S implies

$$(\forall x) \neg Rxx \land (\forall x)(\forall y)(\forall z)(Rxy \supset (Ryz \supset Rxz)) \land (\forall x)(\forall y)(Rxy \lor Ryx \lor x = y).$$

4. (25 points) Write down a schema S involving only the triadic predicate letter "R," the monadic predicate letter "P," and the identity predicate such that S admits n if and only if n is a perfect square, and S implies

$$(\forall x)(\forall y)((Px \land Py) \supset (\exists w)(\forall z)(Rxyz \equiv z = w)).$$