**LGIC 010 & PHIL 005**
**Problem Set 9**
**Spring Term, 2018**
**DUE IN CLASS MONDAY, APRIL 23**

For each of the following pairs consisting of a set of schemata $X$ and a schema $S$ determine whether $X$ implies $S$. If so, provide a rigorous proof to establish the implication. If not, specify a structure which makes $S$ false and all the schemata in $X$ true. Each problem is worth 25 points.

1. $X : \{(\forall x)(\exists y)Lxy\}$
   $S : (\exists y)(\forall x)Lxy$

2. Let $T$ be the schema
$$(\exists x_1)\ldots(\exists x_6)\bigwedge_{1\leq i<j\leq 6} x_i \neq x_j.$$
   $X : \{T, (\forall x)\neg Lxx, (\forall x)(\forall y)(Lxy \supset Lyx)\}$
   $S : (\exists x)(\exists y)(\exists z)(Lxy \wedge Lxz \wedge Lyz) \vee (\exists x)(\exists y)(\exists z)(x \neq y \wedge x \neq z \wedge y \neq z \wedge \neg Lxy \wedge \neg Lxz \wedge \neg Lyz)$

3. $X : \{(\forall x)(\neg Gx \supset (\exists y)(\forall z)(Lxz \equiv y = z)),$
   $(\forall x)(\neg Fx \supset (\exists y)(\forall z)(Lzx \equiv y = z)),$
   $(\forall x)(\forall y)(\forall z)((Lxz \wedge Lyz) \supset x = y),$
   $(\exists x)(\forall y)(Fy \equiv x = y), (\exists x)(\forall y)(Gy \equiv x = y),$
   $(\forall x)(Fx \supset (\forall y)\neg Lyx), (\forall x)(Gx \supset (\forall y)\neg Lxy),$
   $(\forall x)(\forall y)((Px \wedge Lxy) \rightarrow Py), (\forall x)(Fx \supset Px)\}$
   $S : (\forall x)(Gx \supset Px)$

4. $X : \{(\exists y)(\forall x)Lxy\}$
   $S : (\forall x)(\exists y)Lxy$