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 deduction 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. $X : \{(\forall x)(\exists y)Lxy, (\forall x)\neg Lxx\}$
   $S : \neg(\forall x)(\forall y)x = y$

2. Let T be the schema
$$(\exists x_1)\dots(\exists x_5) \bigwedge_{1 \leq i < j \leq 5} x_i \neq x_j.$$

   $X : \{T, (\forall x)\neg Lxx, (\forall x)(\forall y)(Lxy \supset Lyx)\}$
   $S : (\exists x)(\exists y)(\exists z)(Lxy \wedge Lxz \wedge Lyz) \vee (\exists x)(\exists y)(\exists z)(\neg Lxy \wedge \neg Lxz \wedge \neg Lyz)$

3. $X : \{(\forall x)\neg Lxx, (\forall x)(\forall y)(\forall z)(Lxy \supset (Lyz \supset Lxz)), (\forall x)(\forall y)(x \neq y \supset (Lxy \vee Lyx)),$
   $(\forall x)(\exists y)(Lxy \wedge (\forall z)\neg(Lxz \wedge Lzy)))\}$
   $S : (\forall x)((\exists y)Lyx \supset (\exists y)(Lyx \wedge (\forall z)\neg(Lyz \wedge Lzx))),$

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