

## Reading

Read pp. 43–51 in Smullyan for Thursday, March 17 and pp. 52–57 for Tuesday, March 29

## Project Work

Please prepare a project proposal (about half a page) for Tuesday, March 29.

## Questions

(1) Prove or disprove these  $P^2$  formulas:

(a)  $(\forall p)(\forall q) ((p \supset q) \supset ((p \supset \perp) \supset (q \supset \perp)))$

(b)  $(\forall p) \sim p \supset \sim((\exists p)p)$

(c)  $(\forall p)(\exists q) ((p \vee q) \supset p)$

(d)  $(\forall A)(\forall B) (A \vee B \supset (\forall p)((A \supset p) \supset (B \supset p) \supset p))$

(2) Reduce these  $P^2$  formulas to  $P^0$  formulas.

(a)  $(\forall p)p \supset \perp$

(b)  $(\forall p)(\forall q) ((\sim p \vee q) \supset (p \supset q))$

(c)  $(\forall p)(\forall q) ((p \supset p \vee q) \wedge (p \wedge q \supset p))$

(3) Give Refinement logic rules for  $P^2$ .

(4) There is a simple proof for cut elimination in  $P^2$ .

State the theorem and outline a proof. Details are not necessary.