

Interactive Theorem Proving	SS 2013	703641
Week 6		May 2, 2013

Homework

1. Find a λ_P term of the following type:
   (a) $(\forall x.Px \to A) \to (A \to \forall x.\forall y.Qyx) \to Pa \to Qbb$
2. Define in HOL Light the type `drei` that has only 3 elements
   (a) Using the datatype package, as in `ind_types.ml`
   (b) Using the kernel typedef mechanism starting from a known bigger type (for example `num`)
3. Prove formally that $\exists x, y, z \in$ `drei`$.x \neq y \neq z \neq x$
4. Prove in second order propositional logic:
   - $\forall a.(a \to \forall b.(b \to (a \wedge b)))$
   - $\forall b.(\exists a.((a \to b) \wedge (b \to a)))$
   - $\exists a.\exists b.((a \vee b) \wedge (\neg a \vee \neg b))$
5. Find the Curry-Howard isomorphism between 2nd order prop and λ_2
   - Start with the rules for implication and forall
     - Which proof rules correspond to which typing rules?
     - Show the correspondence for each typed rule
   - (harder) How would you extend it to other connectives?