

Interactive Theorem Proving	SS 2013	703641
Week 5		April 25, 2013

Homework

1. Define recursively in HOL-Light the function $f : \mathbb{N} \to \mathbb{N}$ that returns the sum of n first natural numbers.
   (a) Using `new_recursive_definition` and `num_RECURSION`.
   (b) Using `new_definition`. Hint: only one equation is allowed, and you need to encode the recursion yourself (inventing something like the Y combinator or maybe something simpler).
2. Prove that $fn = \frac{n(n+1)}{2}$. Use `DIV` for natural division.
   (a) Using `INDUCT_TAC` and `ARITH...`
   (b) Only using basic tactics, matching and rewriting
3. Prove in Gentzen-style natural deduction:
   (a) $(\forall y.Qy \to Py) \to Qa \to Pa$
   (b) $(\forall x.\forall y.Px \to Py) \to Pa \to \forall x.Px$
4. Give λ_P derivations corresponding to the above proofs.