

# Errata, CS\_336: Interactive Theorem Proving, Lent Term 2004

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## 1: Introduction

- Slide 49d:  $\omega$  and  $\Omega$  were mixed up. The equalities rules which read wrongly

$$\omega = \Omega \quad \Omega = (\lambda x.x x) \Omega \longrightarrow \Omega \quad \Omega = \omega$$

should read correctly:

$$\Omega = \omega \quad \omega = (\lambda x.x x) \omega \longrightarrow \omega \quad \omega = \Omega .$$

- Slide 77: Replace in the second bullet,  $\omega$  by  $\Omega$ . So the infinite reduction sequence reads instead of

$$\omega \longrightarrow \omega \longrightarrow \omega \longrightarrow \dots$$

as follows:

$$\Omega \longrightarrow \Omega \longrightarrow \Omega \longrightarrow \dots$$

- Slide 122: All except of the first reduction are  $\eta$ -reductions, not  $\beta$ -reduction. So the sequence of reductions reads as follows:

$$\begin{aligned} & (\lambda f : ((o \rightarrow o) \rightarrow o \rightarrow o) \rightarrow (o \rightarrow o) \rightarrow o \rightarrow o. \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. f x) f \\ & \longrightarrow_{\beta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. f x \\ & \longrightarrow_{\eta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. \lambda y : o \rightarrow o. f x y \\ & \longrightarrow_{\eta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. \lambda y : o \rightarrow o. \lambda z : o. f x y z \\ & \longrightarrow_{\eta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. \lambda y : o \rightarrow o. \lambda z : o. f (\lambda u : o \rightarrow o. x u) y z \\ & \longrightarrow_{\eta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. \lambda y : o \rightarrow o. \lambda z : o. f (\lambda u : o \rightarrow o. \lambda v : o. x u v) y z \\ & \longrightarrow_{\eta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. \lambda y : o \rightarrow o. \lambda z : o. f (\lambda u : o \rightarrow o. \lambda v : o. x (\lambda w : o. u w) v) y z \\ & \longrightarrow_{\eta} \lambda x : (o \rightarrow o) \rightarrow o \rightarrow o. \lambda y : o \rightarrow o. \lambda z : o. f (\lambda u : o \rightarrow o. \lambda v : o. x (\lambda w : o. u w) v) (\lambda u : o. y u) z \end{aligned}$$

- On slide 143, the last line should be instead of

$$(\langle a_1, \dots, a_n \rangle) =_{\beta} a_i .$$

be

$$\pi_i(\langle a_1, \dots, a_n \rangle) =_{\beta} a_i .$$

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- On slide 159, replace  
**(Re)start Agda (C-c C-x C-b)**  
 by  
**(Re)start Agda (C-c C-x C-c)**

## Coursework 1

- In Question 1,  $\omega$  has to be replaced by  $\Omega$ , so this question reads as follows:  
 Show that  $(\lambda x.(\lambda y.y)) \Omega$ , where  $\Omega$  is defined as in the lecture, has both a normal form and an infinite reduction sequences.

## 2: The Logical Framework

- Slide 33: Replace (N-I<sub>+</sub>) by (N-El<sub>+</sub>).
- Slide 37: Replace (N-I<sub>+</sub>) by (N-El<sub>+</sub><sup>̄</sup>).
- Slide 43: Replace “Assume we have introduced y  $A, B :: \text{Set}$ ” by “Assume we have introduced  $A, B :: \text{Set}$ ”.
- Slide 81: The last line of the derivation should read

$$(\lambda x : A. \lambda y : A. y) : A \rightarrow A \rightarrow A$$

instead of

$$(\lambda x : A. \lambda y : A. y) : A \rightarrow A$$

- Slide 101: The last rule used (at the bottom of the derivation) should be  $(\rightarrow -I^=)$  instead of  $(\text{Sym}_{\text{Elem}})$ .
- Slide 110, replace  $b' : B[x := a]$  by  $b' : B[a := a']$ .
- Slide 125: The last two bullets, which were
  - select male will be an element of  $B(\text{male}) = B(x)[x := \text{male}]$ .
  - It wouldn't make sense to say  $\text{select male} : B(x)$ , without knowing what  $x$  is.

should be rewritten as follows:

- select male will be an element of  $(\text{Names male}) = (\text{Names } g)[g := \text{male}]$ .
- It wouldn't make sense to say  $(\text{select male}) : (\text{Names } g)$ , without knowing what  $g$  is.

### 3: Data Types

- On slide 19, replace everywhere (3 occurrences)  $\text{Case}_{\text{Bool}}$  by  $\text{Case}_{\text{Bool}}^{\text{Type}}$ .
- On slide 22
  - Replace  $tt : \text{Bool}$
  - by  $tt :: \text{Bool}$
  - Replace  $ff : \text{Bool}$
  - by  $ff :: \text{Bool}$
- Slide 58: Replace “ $\text{Eq}_n : \text{Fin}_n \rightarrow \text{Fin}_n \rightarrow \text{Bool}$ ” by “ $\text{Eq}_n : \text{Fin}_n \rightarrow \text{Fin}_n \rightarrow \text{Set}$ ”.
- Slide 60: Replace “ $\text{Bool} \rightarrow \text{Bool} \rightarrow \text{Set}$ ” by “ $\text{Bool} \rightarrow \text{Set}$ ”.

### Revision Lecture

- In slide 6, replace “Type” by “Set” (3 times).

### Solution Coursework 1

- Question 5:
  - In the first subderivation, the rule is (Ap) instead of (Abs).
  - In the second subderivation, the third line (which is the premise of an (Abs)-rule, should read

$$f : (\text{o} \rightarrow \text{o}) \rightarrow \text{o} \rightarrow \text{o}, x : \text{o} \rightarrow \text{o} \Rightarrow f(fx) : \text{o} \rightarrow \text{o}$$

instead of

$$f : (\text{o} \rightarrow \text{o}) \rightarrow \text{o} \rightarrow \text{o}, x : \text{o} \rightarrow \text{o} \Rightarrow f(fx) : (\text{o} \rightarrow \text{o}) \rightarrow \text{o} \rightarrow \text{o}$$