University of Amsterdam
Computer Systems Architecture
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Functionele Talen
2009/2010
February 2, 2010

Assignment Series 1

Foundations — λ-calculus

Consider the following λ-terms:

a) $((\lambda x.\lambda y.y \;\; (\lambda z.(z \;\; z) \;\; \lambda z.(z \;\; z))) \;\; \lambda u.(\lambda v.\lambda w.v \;\; \lambda z.z))$

b) $((((\lambda u.\lambda v.\lambda w.((u \;\; v) \;\; w) \;\; \lambda x.\lambda y.\lambda z.(x \;\; (y \;\; z))) \;\; a) \;\; b) \;\; c)$

c) $\lambda y.(\lambda z.\lambda y.((z \;\; u) \;\; y) \;\; \lambda v.(\lambda w.((w \;\; v) \;\; u) \;\; y))$

Assignment 1: Variable binding and scoping

For each of the above λ-terms mark the bindings of variables to λ-abstractions by an arrow from the variable to the corresponding λ-abstraction. Mark each free variable by a question mark. Do this assignment directly on a print-out of this assignment paper.

Assignment 2: β-reduction

For each of the above λ-terms describe all possible β-reduction sequences. Mark each β-redex by underlining the term and connect the term containing the redex by an arrow to the corresponding term containing the reductum (as demonstrated during the lecture).

Assignment due date: February 9, 2010, lecture