

# Lambda Calculus

## Abstract Syntax

$X = \{x, y, z, \dots\}$  — variables

$C = \{X, Y, Z, \dots\}$  — constructors

$\Lambda =$

|                      |               |
|----------------------|---------------|
| $X$                  | — variable    |
| $C$                  | — constructor |
| $\lambda X. \Lambda$ | — abstraction |
| $\Lambda \Lambda$    | — application |

## Head-Linear Reductions (Small-Step)

$x : A, \Gamma; \Delta \vdash x \rightarrow A$  [VAR]

$$\frac{\Gamma; N \cdot \Delta \vdash M \rightarrow M'}{\Gamma; \Delta \vdash M N \rightarrow M' N}$$
 [APP]

$$\frac{x : B, \Gamma; \Delta \vdash A \rightarrow A'}{\Gamma; B \cdot \Delta \vdash \lambda x. A \rightarrow \lambda x. A'}$$
 [ABS-EMPTY]

$$\frac{\Gamma; \epsilon \vdash A \rightarrow A'}{\Gamma; \epsilon \vdash \lambda x. A \rightarrow \lambda x. A'}$$
 [ABS]