

Lambda Calc!

1 Introduction and Definitions

The λ calculus, often referred to as the smallest universal programming language in the world, consists of a single function definition scheme and a single transformation rule. It is truly universal, because any function that is computable can be expressed and also evaluated using the *lambda* calculus formalism.

The formalisms primarily involve expressions, functions and applications. An expression is defined recursively:

$$\begin{aligned}\langle \text{expression} \rangle &:= \langle \text{name} \rangle \mid \langle \text{function} \rangle \mid \langle \text{application} \rangle \\ \langle \text{function} \rangle &:= \lambda \langle \text{name} \rangle \cdot \langle \text{expression} \rangle \\ \langle \text{application} \rangle &:= \langle \text{expression} \rangle \cdot \langle \text{expression} \rangle\end{aligned}$$

For example, the identity function is $\lambda x \cdot x$

The λ is essentially a theory of *functions* as *formulas*; it is a system for manipulating functions as *expressions*.

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