

Let's Write a Lambda Calculus in Haskell

@mjgpy3

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WHO AM I ?

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Matrix Solutions 

λ 2-3 years

What is the
Lambda Calculus?

1930s

1930s

Alonzo Church

1930s

Alonzo Church

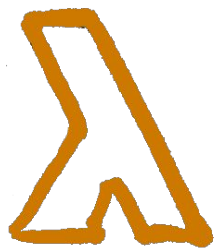
function - centric

1930s

Alonzo Church

function - centric

"Simple"





Variables

Functions

Applications

Variables

a, b, c, \dots, z

Functions

Applications

Variables

a, b, c, \dots, z

Functions

$\lambda \text{variable} . \text{term}$

Applications

Variables

a, b, c, \dots, z

Functions

λ ^{argument} variable . term

Applications

Variables

a, b, c, \dots, z

Functions

λ argument . term
body

Applications

Variables

a, b, c, \dots, z

Functions

$\lambda \text{variable} . \text{term}$

Applications

$(\text{term } \text{term})$

Variables

a, b, c, \dots, z

Functions

$\lambda \text{variable} . \text{term}$

Applications

operator
 (term term)

Variables

a, b, c, \dots, z

Functions

$\lambda \text{variable} . \text{term}$

Applications

operator
 $(\text{term } \text{term})$
 operand

Variables

a, b, c, \dots, z

Functions

$\lambda \text{variable} . \text{term}$

Applications

$(\text{term} \text{ term})$

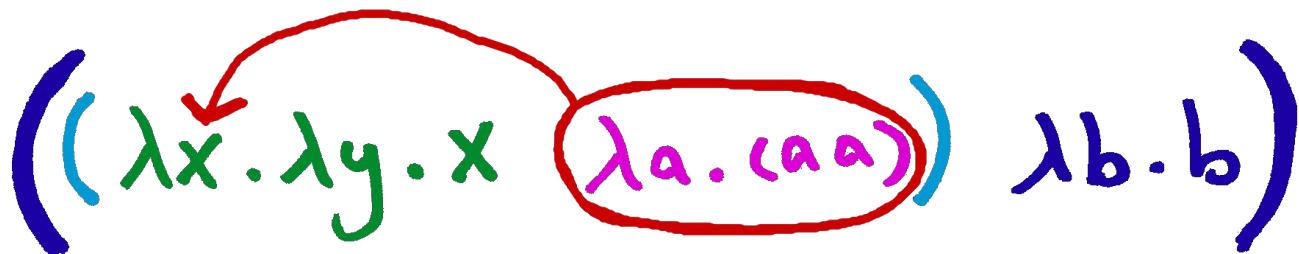
Examples

$\lambda x.x$

$((\lambda x. \lambda y. x \quad \lambda a. (a a)) \quad \lambda b. b)$

$((\lambda x. \lambda y. x \quad \lambda a. (a a)) \quad \lambda b. b)$

$((\lambda x. \lambda y. x \ (\lambda a. (a\ a))) \ \lambda b. b)$



The image shows a handwritten lambda calculus expression: $((\lambda x. \lambda y. x \ (\lambda a. (a\ a))) \ \lambda b. b)$. The expression is written in blue ink. The inner lambda abstraction $\lambda a. (a\ a)$ is circled in red. A red arrow points from the circle to the variable x in the $\lambda x. \lambda y. x$ part of the expression.

$((\lambda x. \lambda y. \textcircled{x} \lambda a. (a a)) \lambda b. b)$

$(\lambda y. \lambda a. (a a) \quad \lambda b. b)$

$(\lambda y. \lambda a. (a a) \quad \lambda b. b)$

$\lambda a. (aa)$

Code Time