Lambda Calculus

Alpha-Conversion

$\lambda x.\ M = \lambda y.\ [x := y]M$ if $(y \text{ nfin } \lambda x.\ M)$

Example

$(\lambda x.\ x) = (\lambda y.\ y)$

```
a = (\x -> x)
a = (\y -> y) -- α-Reduction
```

Beta-Reduction

$(\lambda x.\ M)N = [x := N]M$

Example

$(\lambda x.\ x)a = a$

$(\lambda x.\ xy)a = ay)$

```
a = (\x -> x) 5
a = 5 -- β-Reduction
```

Eta-Reduction

```
add5 xs = map (\x -> x + 5) xs
add5' = map(\x -> x + 5) -- η-Reduction
```