FIT2102 PASS - Week 5

Lambda expressions

λx . x

Arguments, bound variable

λx . xy

Free variable

Operations - Alpha equivalence

$$\lambda x . x = \lambda y . y$$

Operations - Beta reduction

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

$$= (\lambda x\ [x := y].\ x)$$

$$= y$$

Operations - Eta conversion

$$\lambda x \,.\, M\ x = M$$

Combinators - I

$$\lambda x \,.\, x$$

Combinators - K

$$\lambda xy \,.\, x$$

Combinators - K & I

$$(\lambda xy \,.\, x)\ (\lambda x \,.\, x)$$

$$= (\lambda x\ [x := (\lambda x \,.\, x)]\ y \,.\, x)$$

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

$$= \lambda yx \,.\, x$$

Combinators - Divergent

Tim Dwyer's Course Notes

Church Encoding

TRUE = ƛxy . x

FALSE = ƛxy . y

IF = ƛbtf . b t f

AND = ƛxy . IF x y FALSE

OR = ƛxy . IF x TRUE y

NOT = ƛx . IF x FALSE TRUE

Church Encoding - Example

1. NOT TRUE
2. OR TRUE FALSE
3. AND TRUE FALSE