FIT2102 PASS - Week 5

Lambda expressions

λx . x

Arguments, bound variable

λxy . x

Free variable

Operations - Alpha equivalence

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

Operations - Beta reduction

$$(\lambda x \, . \, x) \; {\color{red}y}$$

$$= (\lambda x \, [x := {\color{red}y}]. \; x)$$

$$= {\color{red}y}$$

Operations - Eta conversion

$$\lambda x \mathbin{.} M\ x = M$$

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 = λxy . x

FALSE = λxy . y

IF = λbtf . b t f

AND = λxy . IF x y FALSE

OR = λxy . IF x TRUE y

NOT = λx . IF x FALSE TRUE

Church Encoding - Example

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