

# λ-calculus Cheat Sheet

Ranjit Jhala

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-- Booleans -----
let TRUE  = \x y -> x
let FALSE = \x y -> y
let ITE    = \b x y -> b x y
let NOT    = \b x y -> b y x
let AND    = \b1 b2 -> ITE b1 b2 FALSE
let OR     = \b1 b2 -> ITE b1 TRUE b2

-- Pairs -----
let PAIR = \x y b -> b x y
let FST  = \p -> p TRUE
let SND  = \p -> p FALSE

-- Triples -----
let TRIPLE = \x1 x2 x3 s -> s x1 x2 x3
let FST3   = \t -> t (\x1 x2 x3 -> x1)
let SND3   = \t -> t (\x1 x2 x3 -> x2)
let THD3   = \t -> t (\x1 x2 x3 -> x3)

-- Numbers -----
let ZERO = \f x -> x
let ONE  = \f x -> f x
let TWO  = \f x -> f (f x)
let THREE = \f x -> f (f (f x))
let FOUR  = \f x -> f (f (f (f x)))
let EIGHT = \f x -> f (f (f (f (f (f (f (f x)))))))

-- Arithmetic -----
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let INC = \n f x -> f (n f x)
let ADD = \n m -> n INC m
let MUL = \n m -> n (ADD m) ZERO
let ISZ = \n -> n (\z -> FALSE) TRUE
```