

λ -calculus Cheat Sheet

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Here is a list of definitions you may find useful for your exam.

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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

-- 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))

-- Arithmetic -----
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
```