

## Homework #1

### Lambda Calculus

Due : 09:30, Wednesday, March 19, 2014

Reduce the following lambda expressions as much as possible.

- (1)  $((\lambda x. \lambda y. (x y)) (\lambda y. y)) z$  **z**
- (2)  $(\lambda x. x) (\lambda y. y) (\lambda z. z a)$  **a a**
- (3)  $(\lambda x. \lambda y. x y y) (\lambda z. z) w$  **w w**
- (4)  $(\lambda x. (x x))(\lambda x. (x x))$
- (5)  $(\lambda x. \lambda y. x y z) (\lambda m. m y)$  **(lambda w (w y z))**
- (6)  $(\lambda x. ((\lambda y. (x y)) x)) (\lambda w. z)$  **z**
- (7)  $(((\lambda x. (\lambda y. (\lambda z. ((x z) (y z)))))) (\lambda n. (\lambda m. (m n)))) (\lambda m. a)) b$  **a b**
- (8)  $(\lambda x. ((\lambda y. ((x x) y)) (\lambda z. (w z)))) (\lambda m. (\lambda n. n))$  **(lambda z.w z)**
- (9)  $(\lambda x. x)(\lambda y. (\lambda y. \lambda z. y z) y y)$  **(lambda y.y y)**
- (10)  $\lambda g. (((\lambda f. ((\lambda x. (f(x x))))(\lambda x. (f (x x)))))) g)$