

## Homework #1 Lambda Calculus

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

Reduce the following lambda expressions as much as possible.

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