

## 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)  $(\lambda x. x) (\lambda y. y \ y) (\lambda z. z \ a)$     **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)  $(\lambda x. x \ x) (\lambda y. (\lambda y. \lambda z. y \ z) \ y \ y)$     **(lambda y.y y)**
- (10)  $\lambda g. ((\lambda f. ((\lambda x. (f(x \ x))) (\lambda x. (f \ (x \ x))))) \ g)$