

CS471 Programming Language Structure I

Lambda Calculus

1. Reduce the following expressions to their simplest form

a. $(\lambda x.x x)(\lambda y.y x)z$

b. $(\lambda x.(\lambda y.(x y)) y) z$

c. $((\lambda x.x x)(\lambda y.y))(\lambda y.y)$

d. $((\lambda x.\lambda y.(x y)) (\lambda y.y)) w$

2. The three *combinators* S, K and I are defined as follows:

$$S = \lambda x.\lambda y.\lambda z.(x z (y z))$$

$$K = \lambda x.\lambda y.x$$

$$I = \lambda x.x$$

Verify that $(S K) K$ reduces to I (perhaps with a variable renaming).

Due date: 2/4/08