CSMM: Lesson 1.5 HW

Jake Peck

July 3, 2012

For the following questions, use these function definitions, along with the function definitions from previous homeworks:

$$G := \lambda abc.abc$$

$$Y := \lambda a.(\lambda b.a(bb))(\lambda b.a(bb))$$

$$\chi := \lambda rn.G(\vee(= n0)(= n1))1(+(r(-n1))(r(-n2)))$$

$$\delta := \lambda x.\Phi(xF)(+(xT)(xF))$$

$$\chi_1 := \lambda n.(n\delta(\Phi 01))F$$

(1-2) For each of the following,
Find the normal form of the following λ-expressions (show work)
1. $(Y\chi)3$
2. $\chi_1 3$

3. Define a function ! such that $(Y!)n$ returns $n!$. Try it on a few different values of n to convince yourself that it works.

ANSWERS

Derivations vary, just be careful with parens and variables.

1. 3
2. 3

Several possible formulations exist, one such answer is:

3. $! := \lambda rn.G(= n0)1(\times n(r(-n1)))$