In the name of God

PL homework #3

Seyed Mohammad Mehdi Ahmadpanah – 9031806

scc = $\lambda n . \lambda s . \lambda z . n \, s \, (s \, z)$

e.g. : scc (c2) $\rightarrow$ ($\lambda n . \lambda s . \lambda z . n \, s \, (s \, z)$) c2 $\rightarrow$ $\lambda s . \lambda z . c2 \, s \, (s \, z)$ $\rightarrow$ $\lambda s . \lambda z . (\lambda s . \lambda z . s \, (sz)) \, s(sz)$ $\rightarrow$ $\lambda s . \lambda z . (\lambda z . s \, (s \, z)) \, (s \, z)$ $\rightarrow$ $\lambda s . \lambda z . (s \, (s \, (s \, z)))$ = c3

5.2.3)

mul = $\lambda x . \lambda y . \lambda s . \lambda z . x \, (y \, s) \, z$

power = $\lambda x . \lambda y . x \, (\text{times} \, y) \, c1$

5.2.7)

equal = $\lambda x . \lambda y .$ and (iszero (x prd y)) (iszero (y prd x))

nil = pair tru tru

cons = $\lambda h . \lambda t .$ pair fls (pair h t)

isnil = fst

head = $\lambda h .$ fst (snd h)

tail = $\lambda t .$ snd (snd t)

5.2.10)

f = λx . λy . if iszero x then c0 else scc (y (pred x))

churchnat = fix f

5.2.11)

sum = λm . λn . test (isnil n) (λx . c0) (λx . (plus (head n) (m (tail n)))) c0

sumlist = fix sum