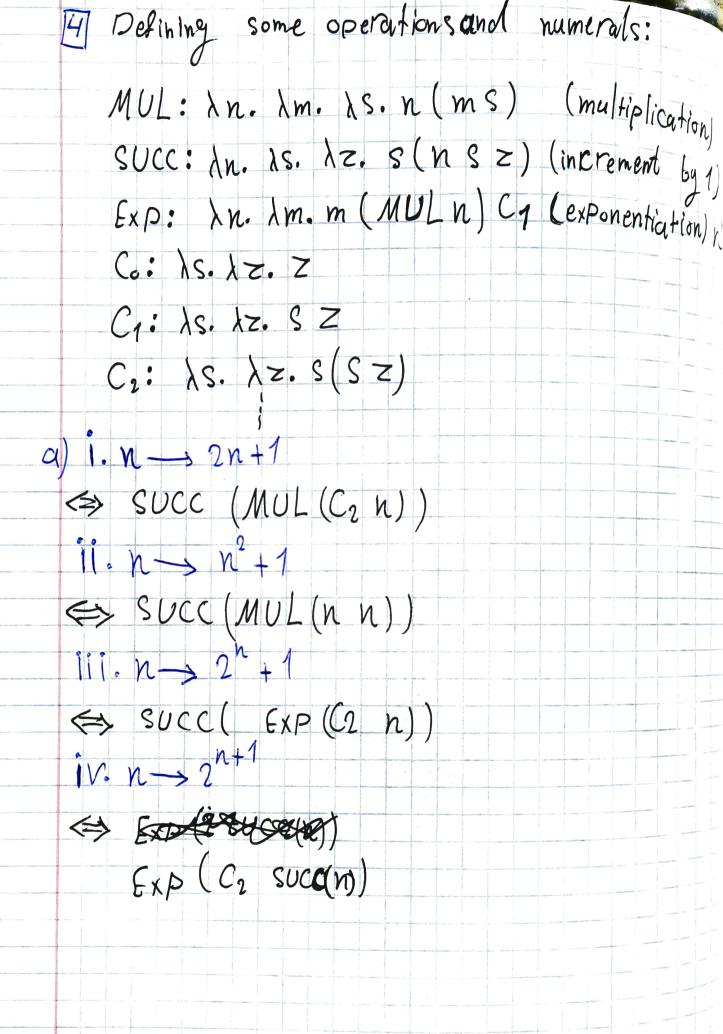


[3] a) We already know that logical AND is represented
as: AND: Xx. Ly. X Y fls
Which Stands for: If x is false then return false,
other wise, return y.
Similarly logical Implication stands for; If x is
false then return true, otherwise, returny.
Thus, by ical implication can be written as:
IMPL: [xx. xy. x y tru]
- So, in terms of bare lambda calculus, it would be:
$[\lambda_x, \lambda_y, \chi_y(\lambda_x, \lambda_y, \chi)]$
b) IMPL fls tru
$(\lambda x. \lambda y. x y tru) Fls tru$
(ly. fls y tru) tru
fls tru tru
$(\lambda \times \lambda y, y) (\lambda_{x}, \lambda_{y}, x) + ru$
λy. y tru ⇒ fru
2) / Y 4 /



Defining some operations and numerals: MUL: \lan. \ SUCC: An. 18. Az. S(n SZ) (increment by 1) Exp: \n. \m. m (MULn) C1 (exponentiation) Co: 15. 12. Z C1: As. LZ. SZ C2: AS. Az. S(SZ) a) $1. N \rightarrow 2n+1$ SUCC (MUL (C2 N)) 11. n -> n +1 SUCC (MUL (n n)) iii. $n \rightarrow 2^n + 1$ SUCC(EXP (C2 n)) $iv. n \rightarrow 2^{n+1}$ (=) EXDAPAGED EXP (C2 SUCC(19))

Succ (MUL (
$$C_1$$
 C_2))

Succ (C_4)

Cs

Succ (C_4)

Succ (C_4)