Assignment -3 Aryon Agazemal 1903 3000 5 (a) Assumption prue: bod EEC Es U SY: Ref body By Identifier Rule, EUdy: Ref books + y: Ref book - O. EUdy: Ref books + true: book - @ [Constant Rule] Using Assignment Rule, Eo USY: Ref bool > - Y:= true: Command · Type of expression · Command. Evgy: Ref booly HPY: Ref bool Eovgy: Ref bool & Home: bool Soufy: Ref books + 4:= true: Command (6) Given :- funcl: monad -> 4, funcz: P -> 4 Eo U &x: monad > funcl: monad -> 4 -0 [constant Rule] Eo U & X: monady + X: monad — @ [Identifier Rule] by Application Rule on 1 and 2, So U & x: monady + funcl x: 4 - 3

E. U. X: moned y + (fund x): 4 - 9 (faren Rule) Eo HA (x: monad). (func/x): monad → 4 - (5) [Function Rule] Similarly, Eo USq & Pg - func 2: 4 - 4 - 6 [constant Rule] -@ [Identifier Rule] E U Sq:44 - 9:4 By Application Rule on 6 and 7, Eo U {q:4} + func2 9:4 - € E. USq: Y's + (bunc2 q): 4 - @ [Paren Rule] So + 1 (9:4). (purc29): 4-14- @ [Function Rule] Using Sequencing rule on 5 and 10, E ← 1(x; monad). (bunclex); 1(q: ∀). (buncl q): (-) Ψ E. U. X: moned + find nond 14 E. U.X: mandy - X: mand E. O. [x; monad)+ funcl: monad & E. o. K: monad)+x: monad E. o. f. & Horz: 4-4 Eofi: 4)+9:4. E up: 67- (pm5 d): 4 Eusx: monado (turc 1x): 4 SHJ(X: monad). (buncl x): monad -y EN-1(9:4) (buc29): 4-14 & + d (x: mond). (bunclx); 1(9:4). (6inc29): 4-34 Type of expression: 9 >4

としい。サッヤッヤッヤ . Using Application Rule, twice [And Poren Rule] E, - (xlt): 4-4 Again using Application Rule, [And Paren Rule] E, L ((xlx)x):4 By Identifier Rule, EUSW:4-TTP - W:4-ATT .. Using Application Rule and Porton Rule, E, - (w((x(t)x)): TT Ving function Rule  $\Sigma_1 \vdash \lambda(x:\Psi).(\omega((x|t)x)):\Psi \rightarrow \pi$ Using Function Rule again E - 1(w: @4 > T). 1(x:4). (w((x) +) x)): 4-3 7-1-4-3 .. Type of the expression: 4-17 -34-17

(c) 1(6; 4→11)·1(x;4)·(n((x|+)x))

E, + +: 4

EUSX: 4)+X:4

By Identifier Rule

By Constant Rule

we have,

(a) 1(f: x→x). 2(x:x). f(+x)

Euffix - yb - fix-y

Now, using Function Rule,

using Function Rule, 
$$\xi \mapsto A(x; x) \cdot f(+x) : x \to y$$

Again using Function Rule, & Hd (f: X-1 Y). d(x:X).f (+x): X-1 Y-1X-1Y

and the same of th

ξυξf: x→yy - f: x→y ξιυξ x: X) - (+x): X
5 u sf: x→y bus x: x/ - f(+x): y
- 1/f: X-JY) + d(k:X) .f(+x): X-31
E, Hd(f:x-y).d(x:x).f(0+x):x-14-1x-14

(e) Given,

Soil = QX: Ref Bool, Y: Booly

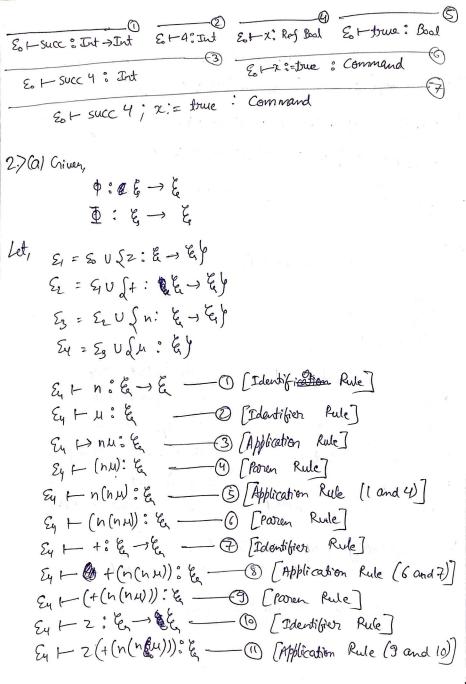
Succ = Dit - Int

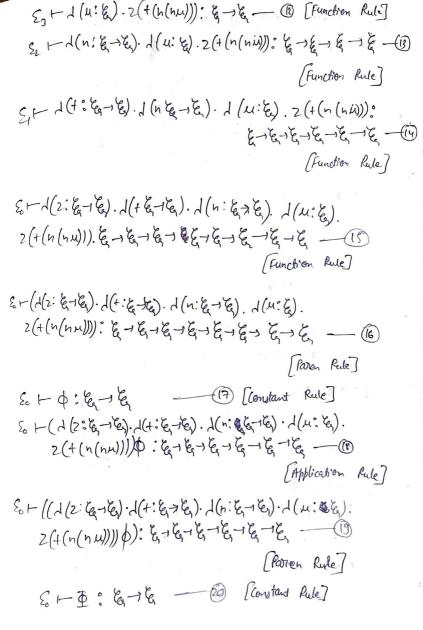
true = Bool

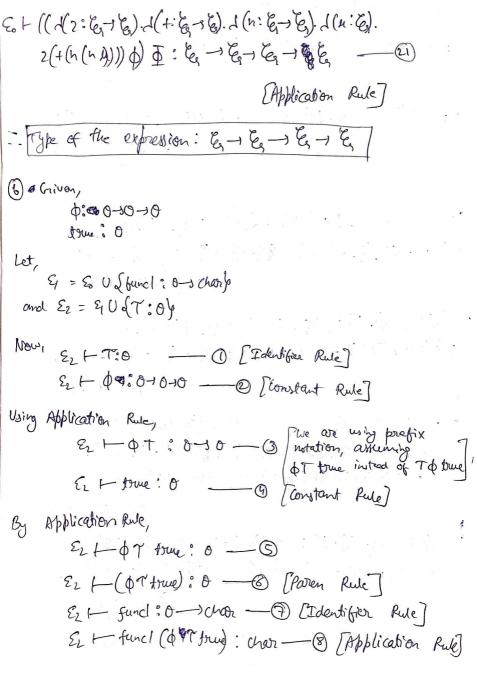
4. Int

E + Succ 4; x:= true: Command

-- Type of expression: Command







€ ord (func1:0-) char). d(7:0).
func1 (\$7 strue):0-) char -10-3 char (1) [Function Pule] of expression: O - ther - o-scher E2 HQ:0-10-10 EL- \$7:0-10 E2 ← (\$ 7+rue):0 Ezt fund: 0-1 Char (8) E2 ← fund (φγtrue): Char EL A(7:0). fund (Ortrue): O-schar East d (fund:0 -) chaos). d (T:0). fund (OT true) : On charton char & Here, we show have prefix for to instantion for of instead of the infix notation.

Ex Hd (7:0). fund ( Ttrue): 0-1 char