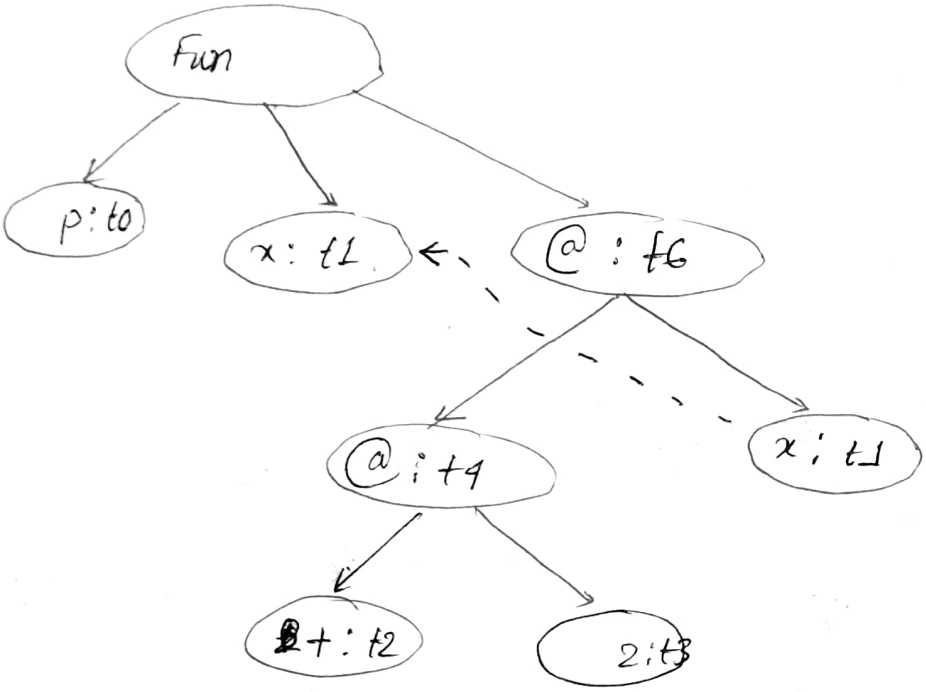
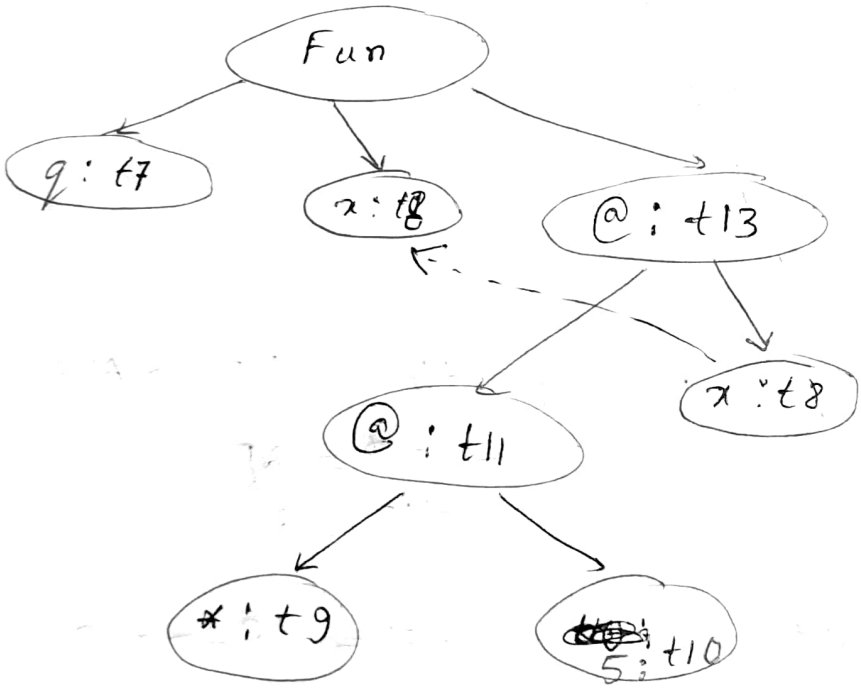
In Class Assignment 2

19CS10060
SUNANDA MANDAL

- $p\,x = 2 + x$



- $q\,x = 5 * x$



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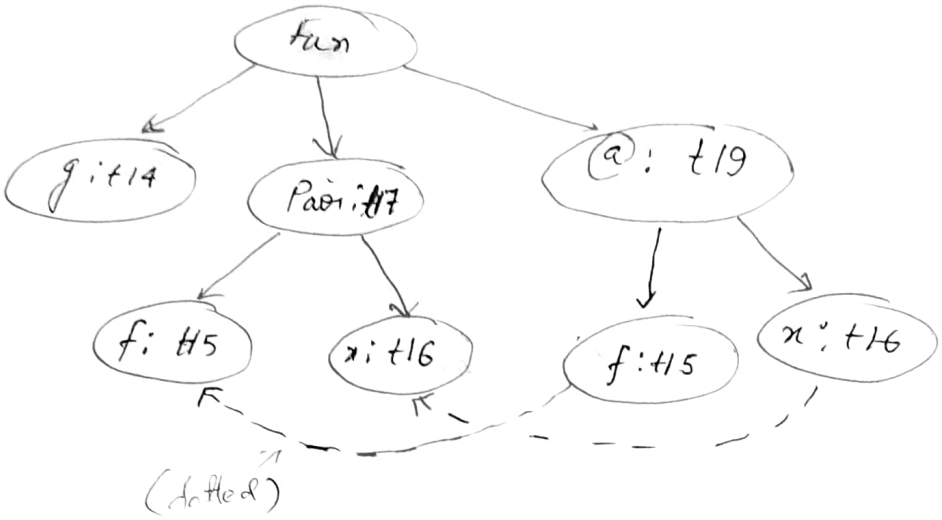
$g\ (f, x) = f\ x$



- Constraints

2 is of type $\mathbb{N}$

and + is " " $\mathbb{N} \to \mathbb{N} \to \mathbb{N}$

$\therefore t3 = \mathbb{N}$

$t2 = \mathbb{N} \to \mathbb{N} \to \mathbb{N}$

$t2 = t3 \to t4$

$\Rightarrow t3 \to t4 = \mathbb{N} \to (\mathbb{N} \to \mathbb{N})$

$\therefore t4 = \mathbb{N} \to \mathbb{N}$

$t9 = t1 \to t6$

$\Rightarrow t1 \to t6 = \mathbb{N} \to \mathbb{N}$

$\therefore t1 = \mathbb{N}$

$t6 = \mathbb{N}$

also, $t0 = t1 \to t6$

$\therefore t0 = \mathbb{N} \to \mathbb{N}$

$\therefore$ p is of type $\mathbb{N} \to \mathbb{N}$

Similarly for q :

$t9 = \mathbb{N} \to \mathbb{N} \to \mathbb{N}$

$t10 = \mathbb{N}$

$t9 = t10 \to t11$

$\Rightarrow t11 = \mathbb{N} \to \mathbb{N}$

$t11 = t8 \to t13$

$\Rightarrow t8 = \mathbb{N}$

$t13 = \mathbb{N}$

$\therefore t7 = t8 \to t13$

$= \mathbb{N} \to \mathbb{N}$

$\therefore$ q is of type $\mathbb{N} \to \mathbb{N}$

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for g :

$t15 = t16 \to t19$

$t17 = (t15, t16)$

$t4 = (t17 \to t19)$

$t4 = (t15, t16) \to t19$ }
$t5 = t16 \to t19$ }

∴ For E

$$E = g(p, g(q, 3))$$

3 is of type $\mathbb{N}$

q " " " $\mathbb{N} \to \mathbb{N}$

⇒ q 3 is of type $\mathbb{N}$

$g(q,3) = q\ 3$

∴ g is of type: $(type\ q, type\ 3) \to (type\ q\ 3)$

$= (\mathbb{N} \to \mathbb{N}, \mathbb{N}) \to \mathbb{N}$

∴ $g(q,3)$ is of type $\mathbb{N}$

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p is of type : $\mathbb{N} \to \mathbb{N}$

$g(q,3)$ is of type : $\mathbb{N}$

∴ $p\ g(q,3)$ is of type : $\mathbb{N}$

$g(p, g(q,3)) = p\ g(q,3)$

g is of type : $(type(p), type(g(q,3))) \to type(p\ g(q,3))$

$= (\mathbb{N} \to \mathbb{N}, \mathbb{N}) \to \mathbb{N}$

∴ $g(p, g(q,3))$ is of type $\mathbb{N}$

Hence, E is of type $\mathbb{N}$