

Ficha 9 23/24

①

$$f \cdot \text{length} = \Delta[0, (2+) \cdot \pi_2]$$

$$\Rightarrow (2+) \cdot \Delta[0, \text{succ} \cdot \pi_2] = \Delta[0, (2+) \cdot \pi_2]$$

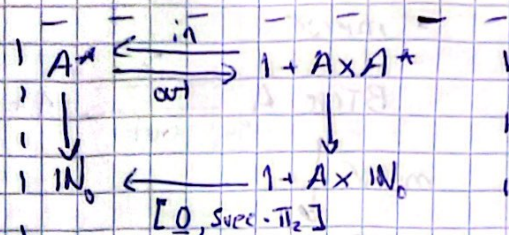
$$\Leftrightarrow (2+) \cdot [0, \text{succ} \cdot \pi_2] = [0, (2+) \cdot \pi_2] \cdot f(2+)$$

$$\Rightarrow \begin{cases} (2+) \cdot 0 = 0 \\ (2+) \cdot \text{succ} \cdot \pi_2 = (2+) \cdot \pi_2 \cdot (id \times (2+)) \end{cases}$$

$$\Rightarrow \begin{cases} 2 \times 0 = 0 \\ 2 \times (b+1) = 2 + 2b \end{cases}$$

$$\Rightarrow \begin{cases} 0 = 0 \\ 2b + 2 = 2b + 2 \end{cases}$$

Terço



$$\text{length} = \Delta[0, \text{succ} \cdot \pi_2]$$

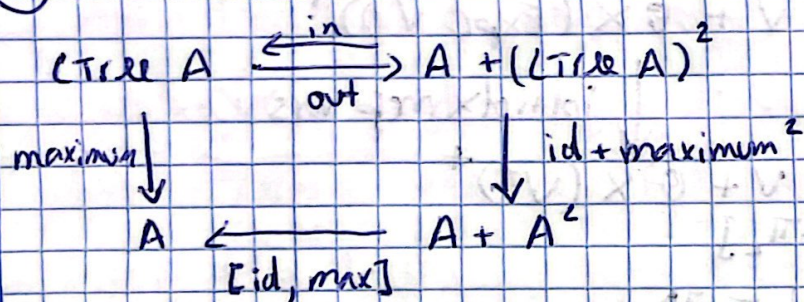
{20, 22, 1, 27}

{72(x2), 73(x5), 75(x2), 79(x2), 75}

o elemento absorvente de multiplicação
Propriedade Distributiva de Multiplicação

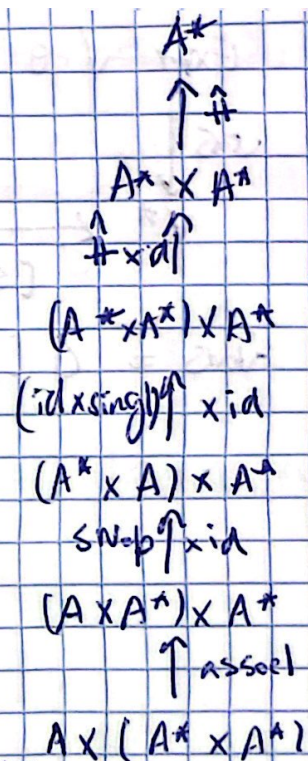
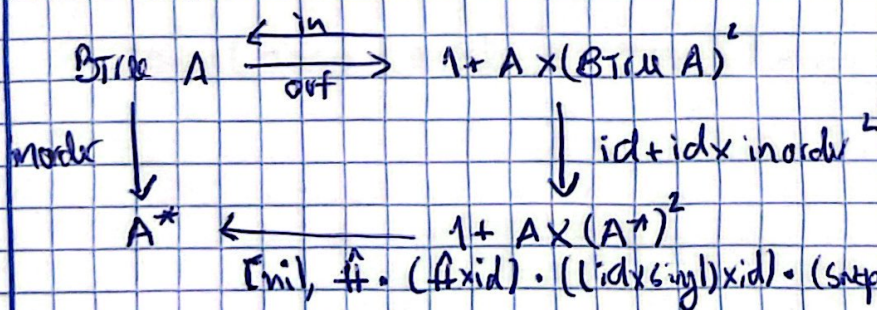
Para (2+) a igualdade não se verifica, o que se constata pela mesma forma.

Q. • maximum

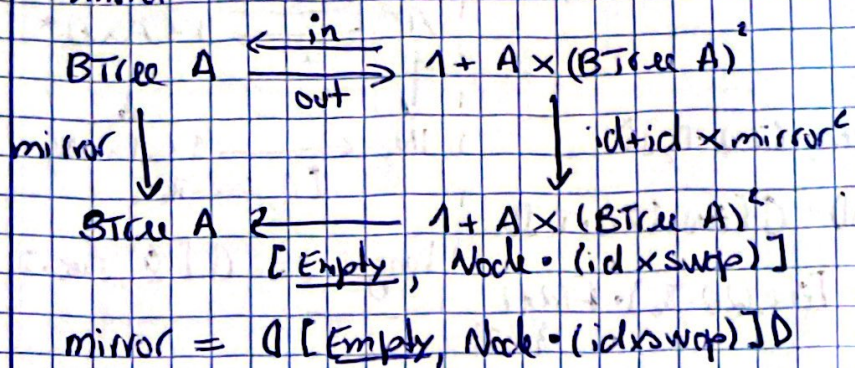


$$\text{maximum} = \mathbb{Q}[id, \max]$$

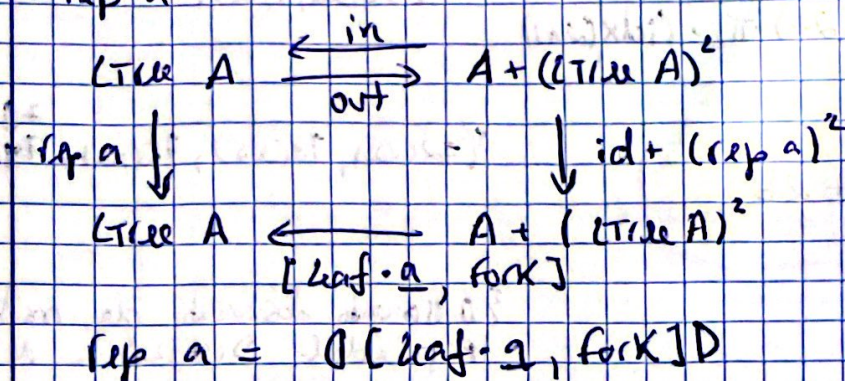
• inorder



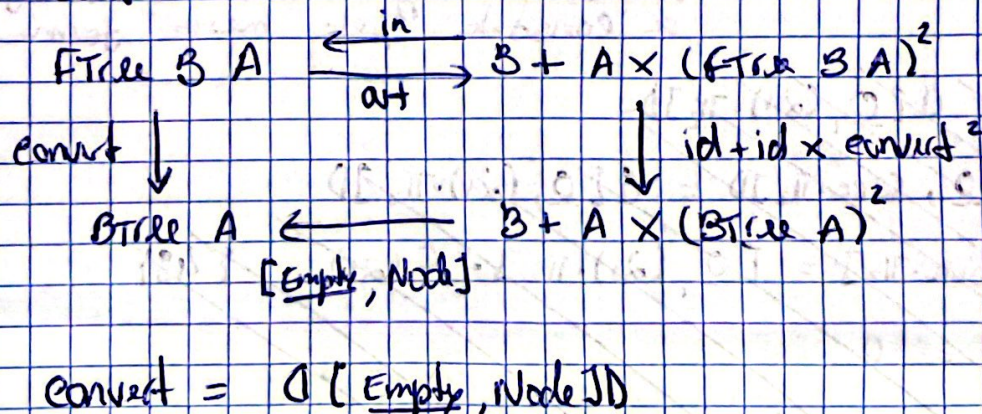
- mirror



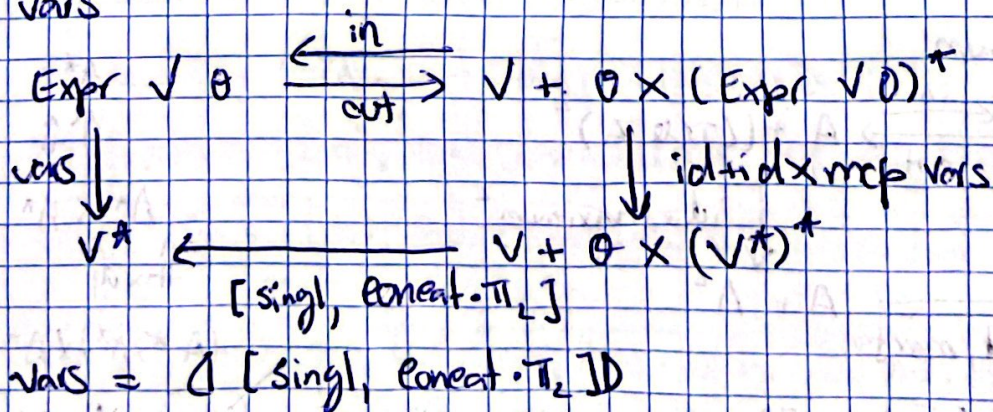
- rep a



- convert



- vars



③

$$DgD \cdot Din \cdot KD = Dg \cdot mD$$

$$\Leftrightarrow DgD \cdot in \cdot K = g \cdot m \cdot F(DgD)$$

{49}

$$\Rightarrow g \cdot F(DgD) \cdot K = g \cdot m \cdot F(DgD)$$

{47}

$$\Leftrightarrow F(DgD) \cdot K = m \cdot F(DgD)$$

{5}

$$\Leftrightarrow Ff \cdot K = m \cdot Ff$$

{ Se este igualdade é válida
por qualquer f , também será
por $f = DgD$ }

4. a)

$$m \cdot Ff = Ff \cdot K$$

$$\Rightarrow (id + swap) \cdot Ff = Ff \cdot (id + swap)$$

{ Def m, K }

$$\Rightarrow (id + swap) \cdot (id + f^2) = (id + f^2) \cdot (id + swap)$$

{ Def F (True) }

$$\Rightarrow id + (swap \cdot f^2) = id + (f^2 \cdot swap)$$

{ 25, 1(22) }

\Rightarrow True

{ Natural swap }

b)

$$mirror \cdot mirror = id$$

$$\Rightarrow (Din \cdot (id + swap)D) \cdot (Din \cdot (id + swap)D) = D(id)$$

{ 48 }

$$\Rightarrow \text{---} = D(in \cdot id)$$

{ 1 }

$$\Rightarrow \text{---} = D(in \cdot (id + id)D)$$

{ 26 }

$$\Rightarrow \text{---} = D(in \cdot (id + swap \cdot swap)D)$$

{ $swap \cdot swap = id$ }

$$\Rightarrow \text{---} = D(in \cdot (id + swap) \cdot (id + swap)D)$$

{ 1, 25 }

$$\Rightarrow \underbrace{Din \cdot (id + swap)D}_g \cdot \underbrace{Din \cdot (id + swap)D}_K = \underbrace{Din \cdot (id + swap)D}_g \cdot \underbrace{(id + swap)D}_m$$

\Leftrightarrow True

{ Por F1, porque provamos na (line a) que
no caso em que $m = K = (id + swap)$, F2
verifique-se. }

(5.)

$$\text{tor} = ()[\text{singl} \cdot \text{nil}, g]$$

$$\Rightarrow \text{tor} \cdot \text{in} = [\text{singl} \cdot \text{nil}, g] \cdot F \text{tor} \quad \{46\}$$

$$\Rightarrow \text{tor} \cdot [\text{Empty}, \text{Node}] = [\text{singl} \cdot \text{nil}, g] \cdot (\text{id} + \text{id} \times \text{tors}^2) \quad \{24 \text{ in } F\}$$

$$\Rightarrow \begin{cases} \text{tor} \cdot \text{Empty} = \text{singl} \cdot \text{nil} \\ \text{tor} \cdot \text{Node} = g \cdot (\text{id} \times \text{tors}^2) \end{cases} \quad \{20, 22, 1, 27\}$$

$$\Rightarrow \begin{cases} \text{tor} \cdot \text{Empty} = [[]] \\ \text{tor} \cdot \text{Node} = (\text{map } \text{cons} \cdot \text{istr} \cdot (\text{id} \times \text{cons})) \cdot (\text{id} \times \text{tors}^2) \end{cases} \quad \{72, 73(x2), 75, 24, g\}$$

$$\Rightarrow \begin{cases} \text{tor} \cdot \text{Empty} = [[]] \\ \text{tor} \cdot \text{Node} = (\text{map } \text{cons}) \cdot \text{istr} \cdot (\text{id} \times (\text{cons} \cdot \text{tors}^2)) \end{cases} \quad \{\text{Assocative}, 12, 1\}$$

$$\Rightarrow \begin{cases} \text{tor} \cdot \text{Empty} = [[]] \\ \text{tor} \cdot \text{Node} (a, (x, y)) = ((\text{map } \text{cons}) \cdot \text{istr}) (a, \text{tors } x \# \text{tors } y) \end{cases} \quad \{72, 74, 74, 73\}$$

$$\Rightarrow \begin{cases} \text{tor} \cdot \text{Empty} = [[]] \\ \text{tor} \cdot \text{Node} (a, (x, y)) = \text{map } \text{cons} \quad [(a, z) \mid z \leftarrow (\text{tors } x \# \text{tors } y)] \end{cases}$$

$$\Rightarrow \begin{cases} \text{tor} \cdot \text{Empty} = [[]] \\ \text{tor} \cdot \text{Node} (a, (x, y)) = [a : z \mid z \leftarrow (\text{tors } x \# \text{tors } y)] \end{cases}$$

(6.)

$$\text{vars} = ()[\text{singl}, \text{concat} \cdot \pi_2]$$

$$\Rightarrow \text{vars} \cdot \text{in} = [\text{singl}, \text{concat} \cdot \pi_2] \cdot F \text{vars} \quad \{46\}$$

$$\Rightarrow \text{vars} \cdot [\text{Var}, \text{Term}] = [\text{singl}, \text{concat} \cdot \pi_2] \cdot (\text{id} + \text{id} \times \text{map } \text{vars}) \quad \{24 \text{ in } F\}$$

$$\Rightarrow \begin{cases} \text{vars} \cdot \text{Var} = \text{singl} \\ \text{vars} \cdot \text{Term} = \text{concat} \cdot \pi_2 \cdot (\text{id} \times \text{map } \text{vars}) \end{cases} \quad \{20, 22, 1, 27\}$$

$$\Rightarrow \begin{cases} \text{vars} \cdot \text{Var} = \text{singl} \\ \text{vars} \cdot \text{Term} = \text{concat} \cdot ((\text{map } \text{vars}) \cdot \pi_2) \end{cases} \quad \{13\}$$

$$\Rightarrow \begin{cases} \text{vars} (\text{Var } v) = [v] \\ \text{vars} (\text{Term} (a, l)) = \text{concat} (\text{map } \text{vars } l) \end{cases} \quad \{72(x2), 73(x2), 73\}$$