Hoja de trabajo 3

Gabriel Chavarria, 20181386, chavarria181386@unis.edu.gt

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1 Ejercicio #1

Sumar s(s(s(0))) $\oplus s(s(s(s(0))))$

$$\text{s(s(s(0)))} \oplus s(s(s(s(0))))$$
$$\text{s(s(s(s(0)))} \oplus s(s(s(0))))$$
$$\text{s(s(s(s(s(0)))} \oplus s(s(0))))$$
$$\text{s(s(s(s(s(s(0)))} \oplus (s(0))))$$
$$\text{s(s(s(s(s(s(0}\oplus\text{0))))}$$
$$\text{s(s(s(s(s(s(0)))))))}$$

2 Ejercicio #2

Definir la multiplicación para numeros naturales unarios:

$$n \otimes m := \begin{cases} 0 & \text{si } n = 0 \\ 0 & \text{si } m = 0 \\ 0 & \text{si } m = 0, n = 0 \\ m & \text{si } n = 1 \\ n & \text{si } m = 1 \\ s(i) \oplus (s(i) \otimes j) & \text{si } n = s(i) \end{cases}$$

3 Ejercicio #3

- $s(s(s(0))) \otimes 0$

  $\underline{s(s(s(0))) \otimes 0 = 0}$, m=0 entonces por definición es 0

- $s(s(s(0))) \otimes s(0)$

  $s(s(s(0))) \otimes s(0)$

  s(0)=1

  s(s(s(0)))$\otimes s(0)$ = $\underline{s(s(s(0)))}$

- $s(s(s(0))) \otimes s(s(0))$

  $s(s(s(0))) \oplus (s(s(s(0))) \otimes s(0))$

  $s(s(s(0))) \oplus (s(s(s(0)))$

  $s(s(s(s(0))) \oplus s(s(0)))$

  $s(s(s(s(s(0))) \oplus s(0)))$

  $s(s(s(s(s(s(0 \oplus 0))))))$

  $\underline{s(s(s(s(s(s(0))))))}$

  Efectivamente 3$\otimes$2 = 6

4 Ejercicio #4

1- $a \oplus s(s(0)) = s(s(a))$
Caso base: $a = 0$

$0 \oplus s(s(0)) = s(s(0))$

s(s(0))=s(s(0))

Caso inductivo: a = s(i)

$s(i) \oplus s(s(0)) = s(s(s(i)))$

$s(s(i) \oplus s(0)) = s(s(s(i)))$

$s(s(s(i \oplus 0))) = s(s(s(i)))$

$\underline{s(s(s(i))) = s(s(s(i)))}$

2-$a \otimes b = b \otimes a$
Caso base: $a = 0$

0 $\otimes b = b \otimes 0$
0=0

Caso inductivo: a = $s(i)$

s(i)$\otimes b = b\otimes$s(i)
$s(i) \oplus (s(i) \otimes b) = s(i) \oplus (s(i) \otimes b)$
$s(i) \otimes b = s(i) \otimes b$
$-s(i) = (n+1)$
$(n+1) \otimes b = (n+1) \otimes b$
$\underline{b = b}$

3- $a \otimes (b \otimes c) = (a \otimes b) \otimes c$
Caso base: $a = 0$

$0 \otimes (b \otimes c) = (0 \otimes b) \otimes c$
$0 = (0) \otimes c$
$0 = 0$

Caso inductivo: a = s(i)=(n+1)

$s(i) \otimes (b \otimes c) = (s(i) \otimes b) \otimes c$
$(n+1) \otimes (b \otimes c) = ((n+1) \otimes b) \otimes c$
nb $\otimes c + bc = (nb \oplus b) \otimes c$
nbc $\oplus bc = nbc \oplus bc$
nbc $\ominus nbc \oplus bc = bc$
bc=bc
c=c
<u>0=0</u>

4-$(a \oplus b) \otimes c = (a \otimes c) \oplus (b \otimes c)$
Caso base: $a = 0$

$(0 \oplus b) \otimes c = (0 \otimes c) \oplus (b \otimes c)$
$(b) \otimes c = (0) \oplus (b \otimes c)$
$b \otimes c = b \otimes c$

Caso inductivo: a = (n+1)

$(a \otimes b) \otimes (n \oplus 1) = (a \otimes (n \oplus 1)) \oplus (b \otimes (n \oplus 1))$
$(a \otimes (n \oplus 1) \oplus (b \otimes (n \oplus 1)) = (an \oplus a) \oplus (bn \oplus b)$
$(an \oplus a) \oplus (bn \oplus b) = (an \oplus a) \oplus (bn \oplus b)$
$(an \ominus an) \oplus (bn \ominus bn) \oplus (a \ominus a) \oplus (b \ominus b) = 0$
<u>0=0</u>

*(Suma: m$\oplus n = s(i \oplus j)$
si n=s(i))