

Hoja de trabajo No.3

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1 Ejercicio 1

$$\begin{aligned} & [s(s(s(s(0))))] \oplus [s(s(s(0)))] \\ & [s(s(s(s(s(0)))))] \oplus [s(s(0))] \\ & [s(s(s(s(s(s(0))))))] \oplus [s(0)] \\ & [s(s(s(s(s(s(s(0)))))))] \oplus 0 \\ & [s(s(s(s(s(s(s(0 \oplus 0)))))))] \\ & [s(s(s(s(s(s(s(0)))))))] \end{aligned}$$

2 Ejercicio 2

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

3 Ejercicio 3

- $s(s(s(0))) \otimes 0$
 0
- $s(s(s(0))) \otimes s(0)$
 $s(s(s(0))) \otimes 1$
 $s(s(s(0)))$
- $s(s(s(0))) \otimes s(s(0))$
 $s(s(s(0))) \oplus [s(s(s(0))) \otimes s(0)]$
 $s(s(s(0))) \oplus (s(s(s(0))))$
 $s(s(s(s(0)))) \oplus (s(s(0)))$
 $s(s(s(s(s(0)))) \oplus (s(0))$
 $s(s(s(s(s(s(0)))))) \oplus 0$
 $s(s(s(s(s(s(0 + 0))))))$
 $s(s(s(s(s(s(0))))))$

4 Ejercicio 4

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

Caso base $a=0$

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

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

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

Caso inductivo $a = s(i)$

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

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

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

$$s(s(s(i))) = s(s(s(i)))$$

- $a \otimes b = b \otimes a$

Caso base $a = 0$

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

$$0 = 0$$

Caso Inductivo $a = s(i)$

$$s(i) \otimes b = b \otimes s(i)$$

$$s(i) \oplus (s(i) \otimes b) = (b \otimes s(i)) \oplus s(i)$$

$$s(i) \oplus (s(i) \otimes b) = s(i) \oplus (s(i) \otimes b)$$

- $a \otimes (b \otimes c) = (a \otimes b) \otimes c$

Caso Base $c = 0$

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

$$a \otimes 0 = (ab) \otimes 0$$

$$0 = 0$$

Caso Inductivo $a = s(i)$

$$s(i) \otimes (b \otimes c) = (s(i) \otimes b) \otimes c$$

$$s(i) \oplus (s(i) \otimes (b \otimes c)) = (s(i) \oplus (s(i) \otimes b)) \otimes c$$

$$s(i) \oplus (s(i) \otimes (b \otimes c)) = s(i) \oplus (s(i) \otimes (b \otimes c))$$

- $(a \oplus b) \otimes c = (a \otimes c) \oplus (b \otimes c)$

Caso base $c = 0$

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

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

$$0 = 0$$

Caso Inductivo $c = s(i)$

$$(a \oplus b) \otimes s(i) = (a \otimes s(i)) \oplus (b \otimes s(i))$$

$$(a \otimes s(i)) \oplus (b \otimes s(i)) = (a \otimes s(i)) \oplus (b \otimes s(i))$$

$$(s(i) \oplus (s(i) \otimes a)) \oplus (s(i) \oplus (s(i) \otimes b)) = (s(i) \oplus (s(i) \otimes a)) \oplus (s(i) \oplus (s(i) \otimes b))$$