Hoja de Trabajo No. 3

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1. Ejercicio #1

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

2. Ejercicio #2

$s(i) \oplus (s(i) \otimes j)$

3. Ejercicio #3

- $s(s(s(0))) \otimes 0$
  Por definición sabemos que cualquier número multiplicado por 0 es igual a 0.
  Entonces: $s(s(s(0))) \otimes 0 = 0$

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

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

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

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

4. Ejercicio #4

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

$$s(s(a+0)) = s(s(a))$$
$$s(s(a)) = s(s(a))$$

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

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

  Hi Inductiva: a = n + 1

$$(n+1) \otimes b = b \otimes (n+1)$$
$$nb + b = bn + b$$
$$nb + b = bn + b$$
$$nb + b - b = bn + b - b$$
$$nb = bn$$

- $a \otimes (b \otimes c) = (a \otimes b) \otimes c$ Caso base: c = 1

$$a \otimes (b \otimes 1) = (a \otimes b) \otimes 1$$
$$a \otimes b = a \otimes b$$

  Hi Inductiva: c = n + 1

$$a \otimes (b \otimes (n+1)) = (a \otimes b) \otimes (n+1)$$
$$a \otimes (bn + b)) = abn + ab$$
$$abn + ab - ab = abn + ab - ab$$
$$abn = abn$$

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

$$((a+b) \otimes (n+1)) = (a \otimes (n+1) + (b \otimes (n+1)))$$
$$an + b + a + bn = an + a + bn + b$$
$$(an + bn) + a + b = an + bn + a + b$$
$$n(a+b) + a + b = n(a+b) + a + b$$
$$n(a+b) + a + b - a - b = n(a+b) + a + b - a - b$$
$$n(a+b) = n(a+b)$$