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Informatica 2
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Hoja de Trabajo #6

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Resolución Ejercicio #1

Definición Recursiva

- *Dado un numero n que pertenece a los numero naturales unitarios y que este sea un n sucesor de cero* ($\sigma n(0) = n$)*.*
- *Y cero (0) el primer numero de los numeros naturales unitarios.*

Suma de dos números

Caso base:

$$n + 0 = n$$
$$\sigma(n) + m = \sigma(n + m)$$

Caso inductivo:

$$\sigma(\sigma(\sigma(0))) + \sigma(\sigma(0))$$
$$\sigma(\sigma(\sigma(0)) + \sigma(\sigma(0)))$$
$$\sigma(\sigma(\sigma(0) + \sigma(\sigma(0))))$$
$$\sigma(\sigma(\sigma(0 + \sigma(\sigma(0)))))$$
$$\sigma(\sigma(\sigma(\sigma(\sigma(0)))))$$

De manera que:
$\sigma(n) = a$, $m = b$, $\sigma(n + m) = c$

Multiplicación de dos números

Caso base:

$$n * 0 = 0$$
$$\sigma(n) * m = \sigma((n) * m) + m$$
$$\sigma(0) * n = \sigma(0 + n)$$

Caso inductivo:

$$(\sigma(0) * \sigma(\sigma(0))$$
$$\sigma(0) + \sigma(0) + \sigma(\sigma(0)) veces... + \sigma(0)$$
$$\sigma(0) + [\sigma(0) + \sigma(\sigma(0)) veces... + \sigma(0)]$$
$$\sigma(0) + [\sigma(0) * (\sigma(0)]$$
$$\sigma(\sigma(0))$$

De manera que:
$\sigma(n) = a$, $m = b$, $\sigma(n * m) = c$

Mayor que para números unitarios

Caso base:

- $\sigma(0) > 0$
- $\sigma(\sigma(n)) > n$

Caso inductivo:

- $\sigma(\sigma(0)) > \sigma(0)$
  $\sigma(0) > 0$

- $\sigma(\sigma(n)) > n$
  $\sigma(\sigma(\sigma(n))) > \sigma(n)$
  $\sigma(\sigma(n)) > n$

Resolución Ejercicio #2

Propiedades con Inducción

0.1. Demostracion 1

$$\begin{gathered} n + 0 = n: \\ \sigma(n) + 0 = \sigma(n) \\ \sigma(n + 0) = \sigma(n) \\ \sigma(n) = \sigma(n) \end{gathered}$$

0.2. Demostracion 2

$$\begin{gathered} n + m = m + n: \\ \sigma(\sigma(0)) + \sigma(\sigma(\sigma(0))) = \sigma(\sigma(\sigma(0))) + \sigma(\sigma(0)) \\ \sigma(\sigma(0) + \sigma(\sigma(\sigma(0)))) = \sigma(\sigma(\sigma(0)) + \sigma(\sigma(0))) \\ \sigma(\sigma(0 + \sigma(\sigma(\sigma(0))))) = \sigma(\sigma(\sigma(0) + \sigma(\sigma(0)))) \\ \sigma(\sigma(\sigma(\sigma(\sigma(0))))) = \sigma(\sigma(\sigma(0 + \sigma(\sigma(0))))) \\ \sigma(\sigma(\sigma(\sigma(\sigma(0))))) = \sigma(\sigma(\sigma(\sigma(\sigma(0))))) \end{gathered}$$

0.3. Demostracion 3

$$\begin{gathered} n * \sigma(\sigma(0)) = n + n: \\ \sigma(n) * \sigma(\sigma(0)) = \sigma(n) + \sigma(n) \\ \sigma(\sigma(0) + n) = \sigma(n) + \sigma(n) \\ \sigma(\sigma(0 + n)) = \sigma(n + \sigma(n)) \\ \sigma(\sigma(n)) = \sigma(\sigma(n)) \\ \sigma(n) + \sigma(n) = \sigma(n) + \sigma(n) \end{gathered}$$