Universidad del Istmo de Guatemala
Facultad de Ingeniería
Informática 1

Laboratorio #4

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1. Ejercicio #1

- $(a \equiv d) :\Leftrightarrow a := \{1, 2, 4, 8, 16, 32, 64\} \equiv d := \{n \in \mathbb{N} \mid \exists i \in \mathbb{N} \,.\, n = 2^i \wedge n < 100\}$
- $(b \equiv f) :\Leftrightarrow b := \{n \ \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, x = n/5\} \equiv f := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, n = x + x + x + x + x\}$
- $(c \equiv e) :\Leftrightarrow c := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, n = x * x\} \equiv e := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, x = \sqrt{n}\}$

2. Ejercicio #2

1. $A := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, n = x/5\}$
2. Partiendo de:
   - $A := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, n = x/5\}$
   - $B := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, n = x/4\}$
   - $C := (A \cap B)$
3. $D := \{n \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, 1 < x < n \ \wedge \ n/x\}$
4. $E := \{e \subset P(\mathbb{N}) \mid \exists x \in \mathbb{N} \ \wedge \ \exists n \subset e \,.\, n = x/15\}$
5. $F := \{f \subset P(\mathbb{N}) \mid \exists x \subset f \ \wedge \ \exists n \subset f \,.\, x + n = 42\}$

3. Ejercicio #3

$P := \{< a, b, c > \ . \ a \in \mathbb{N} \,.\, b \in \mathbb{N} \,.\, c \in \mathbb{N} \mid \exists x \in \mathbb{N} \,.\, x > 1 \,.\, x < a \ \wedge \ x < b \,.\, a/x \ \wedge \ b/x \,.\, c = a * b \ \wedge \ c < 30\}$

4. Ejercicio #4

1. $\lambda x \in \mathbb{N} \,.\, x + x = \{< x,\ x + x > \ | \ x \in \mathbb{N}\}$
2. Partiendo de:
   - $A := \lambda x \in \mathbb{N} \,.\, true = \{< x,\ true > \ | \ x \in \mathbb{N} \ \wedge \ x/5\}$
   - $B := \lambda x \in \mathbb{N} \,.\, false = \{< x,\ false > \ | \ x \in \mathbb{N} \ \wedge \ \neg(x/5)\}$
   - $C := (A \cap B)$
3. $f \circ g \in P(\mathbb{N})$
4. $\lambda x \in \mathbb{N} \,.\, f(g(x)) = \{< x,\ f(g(x)) > \ | \ x \in \mathbb{N} \ \wedge \ f(x) \in \mathbb{N} \ \wedge \ g(x) \subset f(x)\}$

5. Ejercicio #5

1. $f(x) = x^2 \ \rightarrow$ Surjectiva
2. $g(x) = \frac{1}{cos(x-1)} \ \rightarrow$ Injectiva
3. $h(x) = 2x \ \rightarrow$ Bijectiva
4. $w(x) = x + 1 \ \rightarrow$ Bijectiva

6. Ejercicio #6

1. $B_1 := \{< a,\ b > \ | \ a \in \mathbb{N} \,.\, b \in \mathbb{N} \,.\, \forall x \in \mathbb{N} \,.\, a = 2x \ \wedge \ a > 0 \ \wedge \ b > 0\}$
2. $B_{2a} := \{< a,\ b > \ | \ a \in \mathbb{N} \,.\, b \in \mathbb{N} \,.\, \forall x \in \mathbb{N} \,.\, a = (2x + 1) \ \wedge \ b > 0\}$
3. $B_2 := \{< a,\ b > \ | \ a \in \mathbb{N} \,.\, b \in \mathbb{Z} \,.\, \forall x \in \mathbb{N} \,.\, a = (2x + 1) \ \wedge \ b < 0\}$
4. $B := \{< a,\ b > \ | \ a \in \mathbb{N} \,.\, b \in \mathbb{Z}\}$