Universidad del Istmo de Guatemala
Facultad de Ingeniería
Informática 1

Laboratorio #4

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1. Ejercicio #1

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

2. Ejercicio #2

1. $A := \{n \in \mathbb{N} \mid n \,\%5 = 0\}$
2. Partiendo de:
   - $A := \{n \in \mathbb{N} \mid n \,\%5 = 0\}$
   - $B := \{n \in \mathbb{N} \mid n \,\%4 = 0\}$
   - $C := (A \cap B)$
3. $D := \{n \in \mathbb{N} \mid \nexists x \in \mathbb{N} \,.\, 1 < x < n \ \land \ n \,\%x = 0\}$
4. $E := \{e \subset P(\mathbb{N}) \mid \exists x \in \mathbb{N} \ \land \ \exists n \subset e \,.\, x \,\%15 = 0\}$
5. $F := \{f \subset P(\mathbb{N}) \mid \exists x \subset f \ \land \ \exists n \subset f \,.\, x + n = 42\}$

3. Ejercicio #3

$P := \{\langle a, b, c\rangle .\ a,\ b,\ c \in \mathbb{N} \mid \nexists x_1,\ x_2 \in \mathbb{N} \,.\, x > 1 \,.\, x < a \ \land \ x < b \,.\, a \,\%x = 0 \ \land \ b \,\%x = 0 \,.\, c = a * b \ \land \ c < 30\}$

4. Ejercicio #4

1. $A := \{\langle x,\ x + x\rangle \mid x \in \mathbb{N}\}$
2. Partiendo de:
   - $B := \{\langle x,\ true\rangle\ .\ x \in \mathbb{N} \mid x\,\%5 = 0\}$
   - $C := \{\langle x,\ false\rangle\ .\ x \in \mathbb{N} \mid x\,\%5 \neq 0\}$
   - $D := (A \cup B)$
3. $(f \circ g) \in P(\mathbb{N})$
4. $E := \{\langle x,\ f(g(x))\rangle \mid x \in \mathbb{N}\ \wedge\ f(x) \in \mathbb{N}\ \wedge\ g(x) \subset f(x)\}$

5. Ejercicio #5

1. $f(x) = x^2\ \rightarrow$ Surjectiva
2. $g(x) = \frac{1}{cos(x-1)}\ \rightarrow$ No es ninguna
3. $h(x) = 2x\ \rightarrow$ Bijectiva
4. $w(x) = x + 1\ \rightarrow$ Bijectiva

6. Ejercicio #6

1. $B_1 := \{\langle a,\ b\rangle.\ a,\ b \in \mathbb{N} \mid a\,\%2 = 0\ \wedge\ a > 0\ .\ b > 0\}$
2. $B_{2a} := \{\langle a,\ b\rangle.\ a,\ b \in \mathbb{N} \mid a\,\%2 \neq 0\ \wedge\ a > 0\ .\ b > 0\}$
3. $B_2 := \{\langle a,\ b\rangle.\ a,\ b \in \mathbb{N} \mid a\,\%2 \neq 0\ \wedge\ a > 0\ .\ b < 0\}$
4. $B := \{\langle a,\ b\rangle \mid a \in \mathbb{N}\ .\ b \in \mathbb{Z}\} \equiv (\{\langle 0,\ 0\rangle\} \cup B_1 \cup B_2)$