

Math 2013 - Introduction to Discrete Mathematics

Homework #2 - 2005.08.31

Due Date - 2005.09.09

1. Let x and y be real numbers, and $P(x, y) : x^2 + y^2 = 1$. Determine if the following statements are true or false. Note: $\exists!$ means 'there exists a unique'.

a) $(\forall y) (\exists x) P(x, y)$

b) $(\exists y) (\forall x) P(x, y)$

c) $(\exists y) (\exists!x) P(x, y)$

2. Let $\Sigma_1 = \{0, 10\}$ and $\Sigma_2 = \{0, 010\}$ be alphabets and define Σ_1^* and Σ_2^* to be the set of words over Σ_1 and Σ_2 respectively. Prove the following:

a) $\Sigma_2^* \subseteq \Sigma_1^*$

b) $\Sigma_1^* \not\subseteq \Sigma_2^*$

3. Define $U = \{0, 1, 2, 3, a, b, c, d\}$, $A = \{0, 1, 2, 3\}$, $B = \{a, b, c, d\}$ and $C = \{2, 3, a\}$. Find the binary representations of the following sets.

a) $B \cup C$

b) $A \cap C$

c) $A \oplus C$

d) $C - A$

e) $U - C$

4. Create a finite partition of \mathbb{R} .

5. Create an infinite partition of \mathbb{R} .

6. Compute the power set of the set $S = \{0, 1, 101\}$

7. Let $U = \{a, b, c, d, e, g, h\}$. Using the binary representation of sets, answer the following questions. Do not write your answers in binary!

a) Find the subset of the set U which follows the set represented by:

1	0	0	1	1	1	1
---	---	---	---	---	---	---

b) Find the subset of the set U which is followed by the set represented by:

1	0	1	1	1	0	0
---	---	---	---	---	---	---