Mathematical Reasoning-Midterm 2

MATH 300   (Instructor: Tom Benhamou)   March 25, 2024

Instruction

The midterm consists of 3 problems, each worth 34 points (The maximal grade is 100). For this you will have 45 minutes during class. No material is allowed during the exam. The answers to the problems should be answered in the designated areas.

Problems

Problem 1. Answer the following items:

    a. $\emptyset \in P(\emptyset) \times P(\emptyset)$.   True   \   False

    b. For any sets A, B, C, D:

        $(A \cap B) \setminus (C \cap D) = (A \setminus C) \cap (B \setminus D)$.   True   \   False

    c. $P(\mathbb{N}_{even}) \subseteq P(\mathbb{N}) \setminus P(\mathbb{N}_{odd})$.   True   \   False

Problem 2. Prove by induction that for all $n \in \mathbb{N}$, $7^n - 2^n$ is divisible by 5.

Solution:

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Problem 3. Prove that for any sets A, B, C:

$$(A \cap B) \setminus C = (A \setminus C) \cap (B \setminus C)$$