Week 4: Gödel Numbering and Representability

Mathematical Logic Course

April 24, 2023

Introduction

- Welcome to Week 4 of our Mathematical Logic Course!
- This week, we'll explore Gödel numbering and the concept of representability.
- We'll cover the following topics:
  - Introduction to Gödel numbering
  - Representability of recursive functions in formal systems
  - Examples and applications

Gödel Numbering

- What is Gödel numbering?
- Kurt Gödel's contributions to mathematical logic
- Encoding formulas, proofs, and sequences as natural numbers
- The significance of Gödel numbering in the Incompleteness Theorems

Representability

- What does it mean for a function to be representable in a formal system?
- Recursive functions and their representability
- Formalizing mathematical theories (e.g., Peano Arithmetic)
- The concept of a complete and consistent formal system

Examples of Representability

- Example: Representing addition and multiplication in a formal system
- Example: Representing the successor function in Peano Arithmetic
- Example: Representing the prime function in a formal system

Summary and Conclusion

- Recap of the topics covered in this lecture
- Gödel numbering and the concept of representability
- The foundational role of Gödel numbering in Gödel's Incompleteness Theorems
- Next week, we'll dive into Gödel's First Incompleteness Theorem

Questions and Discussion

- Do you have any questions about today's lecture?
- Let's discuss the material and explore any questions you may have

Coding Exercises

- Generating Gödel numbers for formulas and exploring representability in Python
- Implementing recursive functions and testing their representability