Introduction to the Philosophy of Mathematicc 2010
Written Exam: December 20, 2010
15.15-18.00 uur HG 08A05

Nota bene: Try to give quite complete answers. An answer should give some context and examples. Imagine that you are explaining something to another student. Don't assume all kinds of background knowledge. Give examples!
You can get max 10 points for each question.
Grade: (Total of points times 10)/40.
Your final grade is the average of this grade and the grade for the presentation.

1. Two central questions in the philosophy of mathematics are the following: i) The ontological question: What are mathematicians studying?, ii) The epistemological question: How are they studying it? How did Plato, Aristotle and Kant answer these questions? Explain in this context the difference between a philosopher who believes in the existence of actual infinity and a philosopher who only accepts potential infinity?

2. Non-Euclidean geometries and other developments in the 19th century led to Hilbert's structuralism. Explain this development. Why was the problem of consistency for Hilbert so important? What is Hilbert's formalist program and the relation between this program and Gödel's incompleteness theorems.

3. The main character in *Logicomix* is Bertrand Russell. The main story is Russell's search for a perfect foundation of mathematics. In the developments leading to the *Principia Mathematica* several mathematicians and logicians played a role. What was the role of Georg Cantor, Giuseppe Peano and Gotlob Frege. Did Russell succeed in giving the perfect foundation?

4. What is Imre Lakatos' fallibilism? Explain how Lakatos could interpret the developments in the foundations of mathematics in the first half of the 20^{th} century as a confirmation of his views?