

# Topics for final exam

1. Direct and indirect proofs.
2. How do we prove general sentences?
3. Proof by cases.
4. Schema of a definition of a predicate.
5. Schema of a definition of a function symbol; uniqueness and existence conditions.
6. Schema of a definition of a constant symbol; uniqueness and existence conditions.
7. Mathematical induction, its equivalent versions (including the least number principle and ordinal induction).
8. A schema of inductive proof.
9. Axiom schema of abstraction and Russell's paradox.
10. Axiom schema of comprehension.
11. Axiom of extensionality (formulation and applications).
12. Axioms of union and pairing (formulation and applications).
13. The notion of an ordered pair in set theory.
14. The notion of a power set, the power set axiom.
15. The operation of Cartesian product of sets.
16. Binary relations and their formal properties.
17. Ordering, linear ordering.
18. Functions and their properties. Injections, surjections, bijections.
19. Equipollence of sets.
20. Cantor's theorem.
21. Countable and uncountable sets.
22. Continuum hypothesis.
23. Basic syntactic notions: terms, formulas and sentences.
24. The notion of a formal proof.
25. The syntactic consequence operation. What does it mean that a sentence follows syntactically from a set of sentence?
26. The notion of a model.
27. The notions of satisfaction and truth in a model.
28. What does it mean that a sentence follows semantically from a set of sentences?
29. The completeness theorem (formulation).
30. Gödel's incompleteness theorems (formulation).