Mathematical Logic Undergraduate Texts In Mathematics

Mathematical LogicPhilosophical and Mathematical LogicLOGIC: Lecture Notes for Philosophy, Mathematics, and Computer ScienceMathematical LogicMathematical LogicModern Mathematical LogicA Beginner's Guide to Mathematical LogicIntroduction to Mathematical LogicMathematical LogicA Mathematical Introduction to LogicThe Applications of LogicIntroduction to Mathematical LogicMathematical LogicA Course on Mathematical LogicIntroduction to Discrete Mathematics via Logic and ProofA Concise Introduction to Mathematical LogicMathematical LogicThe Applications of LogicProof Theory and Algebra in LogicLogic for Computer Scientists H.-D. Ebbinghaus Harrie de Swart Andrea Iacona Heinz-Dieter Ebbinghaus Daniel Cunningham Joseph Mileti Raymond M. Smullyan Jerome Malitz Wei Li Herbert Enderton Archer Tyler Robinson Elliott Mendelson George Tourlakis Shashi Mohan Srivastava Calvin Jongsma Wolfgang Rautenberg Ian Chiswell A. Tyler Robinson Hiroakira Ono Uwe Schöning
Mathematical Logic Philosophical and Mathematical Logic LOGIC: Lecture Notes for Philosophy, Mathematics, and Computer Science Mathematical Logic Mathematical Logic Modern Mathematical Logic A Beginner's Guide to Mathematical Logic Introduction to Mathematical Logic Mathematical Logic A Mathematical Introduction to Logic The Applications of Logic Introduction to Mathematical Logic Mathematical Logic A Course on Mathematical Logic Introduction to Discrete Mathematics via Logic and Proof A Concise Introduction to Mathematical Logic Mathematical Logic The Applications of Logic Proof Theory and Algebra in Logic Logic for Computer Scientists *H.-D. Ebbinghaus Harrie de Swart Andrea Iacona Heinz-Dieter Ebbinghaus Daniel Cunningham Joseph Mileti Raymond M. Smullyan Jerome Malitz Wei Li Herbert Enderton Archer Tyler Robinson Elliott Mendelson George Tourlakis Shashi Mohan Srivastava Calvin Jongsma Wolfgang Rautenberg Ian Chiswell A. Tyler Robinson Hiroakira Ono Uwe Schöning*

what is a mathematical proof how can proofs be justified are there limitations to provability to what extent can machines carry out mathe matical proofs only in this century has there been success in obtaining substantial and satisfactory answers the present book contains a systematic discussion of these results the investigations are centered around first order logic our first goal is godel s completeness theorem which shows that the con sequence relation coincides with formal provability by means of a calcu lus consisting of simple

formal inference rules one can obtain all conse quences of a given axiom system and in particular imitate all mathemat ical proofs a short digression into model theory will help us to analyze the expres sive power of the first order language and it will turn out that there are certain deficiencies for example the first order language does not allow the formulation of an adequate axiom system for arithmetic or analysis on the other hand this difficulty can be overcome even in the framework of first order logic by developing mathematics in set theoretic terms we explain the prerequisites from set theory necessary for this purpose and then treat the subtle relation between logic and set theory in a thorough manner

this book was written to serve as an introduction to logic with in each chapter if applicable special emphasis on the interplay between logic and philosophy mathematics language and theoretical computer science the reader will not only be provided with an introduction to classical logic but to philosophical modal epistemic deontic temporal and intuitionistic logic as well the first chapter is an easy to read non technical introduction to the topics in the book the next chapters are consecutively about propositional logic sets finite and infinite predicate logic arithmetic and gödel s incompleteness theorems modal logic philosophy of language intuitionism and intuitionistic logic applications prolog relational databases and sql social choice theory in particular majority judgment and finally fallacies and unfair discussion methods throughout the text the author provides some impressions of the historical development of logic stoic and aristotelian logic logic in the middle ages and frege s begriffsschrift together with the works of george boole 1815 1864 and august de morgan 1806 1871 the origin of modern logic since if then can be considered to be the heart of logic throughout this book much attention is paid to conditionals material strict and relevant implication entailment counterfactuals and conversational implicature are treated and many references for further reading are given each chapter is concluded with answers to the exercises philosophical and mathematical logic is a very recent book 2018 but with every aspect of a classic what a wonderful book work written with all the necessary rigor with immense depth but without giving up clarity and good taste philosophy and mathematics go hand in hand with the most diverse themes of logic an introductory text but not only that it goes much further it s worth diving into the pages of this book dear reader paulo sérgio argolo

this textbook is a logic manual which includes an elementary course and an advanced course it covers more than most introductory logic textbooks while maintaining a comfortable pace that students can follow the technical exposition is clear precise and follows a paced increase in complexity allowing the reader to get comfortable with previous definitions and procedures before facing more difficult material the book also presents an interesting overall balance between formal and philosophical discussion making it suitable for both philosophy and more formal science oriented students this textbook is of

great use to undergraduate philosophy students graduate philosophy students logic teachers undergraduates and graduates in mathematics computer science or related fields in which logic is required

mathematical logic an introduction is a textbook that uses mathematical tools to investigate mathematics itself in particular the concepts of proof and truth are examined the book presents the fundamental topics in mathematical logic and presents clear and complete proofs throughout the text such proofs are used to develop the language of propositional logic and the language of first order logic including the notion of a formal deduction the text also covers tarski s definition of truth and the computability concept it also provides coherent proofs of godel s completeness and incompleteness theorems moreover the text was written with the student in mind and thus it provides an accessible introduction to mathematical logic in particular the text explicitly shows the reader how to prove the basic theorems and presents detailed proofs throughout the book most undergraduate books on mathematical logic are written for a reader who is well versed in logical notation and mathematical proof this textbook is written to attract a wider audience including students who are not yet experts in the art of mathematical proof

this textbook gives a complete and modern introduction to mathematical logic the author uses contemporary notation conventions and perspectives throughout and emphasizes interactions with the rest of mathematics in addition to covering the basic concepts of mathematical logic and the fundamental material on completeness compactness and incompleteness it devotes significant space to thorough introductions to the pillars of the modern subject model theory set theory and computability requiring only a modest background of undergraduate mathematics the text can be readily adapted for a variety of one or two semester courses at the upper undergraduate or beginning graduate level numerous examples reinforce the key ideas and illustrate their applications and a wealth of classroom tested exercises serve to consolidate readers understanding comprehensive and engaging this book offers a fresh approach to this enduringly fascinating and important subject

written by a creative master of mathematical logic this introductory text combines stories of great philosophers quotations and riddles with the fundamentals of mathematical logic author raymond smullyan offers clear incremental presentations of difficult logic concepts he highlights each subject with inventive explanations and unique problems smullyan s accessible narrative provides memorable examples of concepts related to proofs propositional logic and first order logic incompleteness theorems and incompleteness proofs additional topics include undecidability combinatoric logic and recursion theory suitable for undergraduate and graduate courses this book will also amuse and enlighten

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this book is intended as an undergraduate senior level or beginning graduate level text for mathematical logic there are virtually no prere quisites although a familiarity with notions encountered in a beginning course in abstract algebra such as groups rings and fields will be useful in providing some motivation for the topics in part iii an attempt has been made to develop the beginning of each part slowly and then to gradually quicken the pace and the complexity of the material each part ends with a brief introduction to selected topics of current interest the text is divided into three parts one dealing with set theory another with computable function theory and the last with model theory part iii relies heavily on the notation concepts and results discussed in part i and to some extent on part ii parts i and ii are independent of each other and each provides enough material for a one semester course the exercises cover a wide range of difficulty with an emphasis on more routine problems in the earlier sections of each part in order to familiarize the reader with the new notions and methods the more difficult exercises are accompanied by hints in some cases significant theorems are devel oped step by step with hints in the problems such theorems are not used later in the sequence

mathematical logic is a branch of mathematics that takes axiom systems and mathematical proofs as its objects of study this book shows how it can also provide a foundation for the development of information science and technology the first five chapters systematically present the core topics of classical mathematical logic including the syntax and models of first order languages formal inference systems computability and representability and gödel s theorems the last five chapters present extensions and developments of classical mathematical logic particularly the concepts of version sequences of formal theories and their limits the system of revision calculus proschemes formal descriptions of proof methods and strategies and their properties and the theory of inductive inference all of these themes contribute to a formal theory of axiomatization and its application to the process of developing information technology and scientific theories the book also describes the paradigm of three kinds of language environments for theories and it presents the basic properties required of a meta language environment finally the book brings these themes together by describing a workflow for scientific research in the information era in which formal methods interactive software and human invention are all used to their advantage this book represents a valuable reference for graduate and undergraduate students and researchers in mathematics information science and technology and other relevant areas of natural sciences its first five chapters serve as an undergraduate text in mathematical logic and the last five chapters are addressed to graduate students in relevant disciplines

this title offers increased flexibility with topic coverage allowing for choice in how to utilize the textbook in a course the author has made this edition more accessible to better meet the needs of today s undergraduate mathematics and philosophy students it is intended for the reader who has not studied logic previously but who has some experience in mathematical reasoning

a comprehensive and user friendly guide to the use of logic in mathematical reasoning mathematical logic presents a comprehensive introduction to formal methods of logic and their use as a reliable tool for deductive reasoning with its user friendly approach this book successfully equips readers with the key concepts and methods for formulating valid mathematical arguments that can be used to uncover truths across diverse areas of study such as mathematics computer science and philosophy the book develops the logical tools for writing proofs by guiding readers through both the established hilbert style of proof writing as well as the equational style that is emerging in computer science and engineering applications chapters have been organized into the two topical areas of boolean logic and predicate logic techniques situated outside formal logic are applied to illustrate and demonstrate significant facts regarding the power and limitations of logic such as logic can certify truths and only truths logic can certify all absolute truths completeness theorems of post and gödel logic cannot certify all conditional truths such as those that are specific to the peano arithmetic therefore logic has some serious limitations as shown through gödel s incompleteness theorem numerous examples and problem sets are provided throughout the text further facilitating readers understanding of the capabilities of logic to discover mathematical truths in addition an extensive appendix introduces tarski semantics and proceeds with detailed proofs of completeness and first incompleteness theorems while also providing a self contained introduction to the theory of computability with its thorough scope of coverage and accessible style mathematical logic is an ideal book for courses in mathematics computer science and philosophy at the upper undergraduate and graduate levels it is also a valuable reference for researchers and practitioners who wish to learn how to use logic in their everyday work

this is a short modern and motivated introduction to mathematical logic for upper undergraduate and beginning graduate students in mathematics and computer science any mathematician who is interested in getting acquainted with logic and would like to learn gödel s incompleteness theorems should find this book particularly useful the treatment is thoroughly mathematical and prepares students to branch out in several areas of mathematics related to foundations and computability such as logic axiomatic set theory model theory recursion theory and computability in this new edition many small and large changes have been made throughout the text the main purpose of this new edition is to provide a healthy first introduction to model theory which is a very important branch

of logic topics in the new chapter include ultraproduct of models elimination of quantifiers types applications of types to model theory and applications to algebra number theory and geometry some proofs such as the proof of the very important completeness theorem have been completely rewritten in a more clear and concise manner the new edition also introduces new topics such as the notion of elementary class of structures elementary diagrams partial elementary maps homogeneous structures definability and many more

this textbook introduces discrete mathematics by emphasizing the importance of reading and writing proofs because it begins by carefully establishing a familiarity with mathematical logic and proof this approach suits not only a discrete mathematics course but can also function as a transition to proof its unique deductive perspective on mathematical logic provides students with the tools to more deeply understand mathematical methodology an approach that the author has successfully classroom tested for decades chapters are helpfully organized so that as they escalate in complexity their underlying connections are easily identifiable mathematical logic and proofs are first introduced before moving onto more complex topics in discrete mathematics some of these topics include mathematical and structural induction set theory combinatorics functions relations and ordered sets boolean algebra and boolean functions graph theory introduction to discrete mathematics via logic and proof will suit intermediate undergraduates majoring in mathematics computer science engineering and related subjects with no formal prerequisites beyond a background in secondary mathematics

this book is unique in treating mathematical logic in a concise and streamlined fashion this allows many important topics to be covered in a one semester course although the book is intended for use as a graduate text the first three chapters can be understood by undergraduates interested in mathematical logic the remaining chapters contain material on logic programming for computer scientists model theory recursion theory godel s incompleteness theorems and applications of mathematical logic philosophical and foundational problems of mathematics are discussed throughout the text and the author has provided exercises for each chapter as well as hints to selected exercises traditional logic as a part of philosophy is one of the oldest scientific disciplines mathematical logic however is a relatively young discipline and arose from the endeavors of peano frege russell and others to create a logistic foundation for mathematics

assuming no previous study in logic this informal yet rigorous text covers the material of a standard undergraduate first course in mathematical logic using natural deduction and leading up to the completeness theorem for first order logic

excerpt from the applications of logic a text book for college students this book is based on

ten years of class room experience at the massachusetts institute of technology first with courses in formal logic and latterly with an attempt to adapt some of the more fundamental theories of logic to the practical aim of instruction in the expression and the criticism of thought such an attempt has seemed not out of place with any class of students but particularly important in connection with the work of a technical school the graduates of which are likely to find in their professional life more use for an orderly structure of ideas than for the niceties of expression the purpose of the book is to treat the whole subject of logic in so far as it bears on the practical work of thinking and of expressing thought it is intended as a text book of applied logic suitable for use as an introduction to the subject with college classes to some extent therefore the exercises proposed take the form of work in composition but at the same time many of them are intended rather to cultivate the critical faculty by a direct exercise of the judgment these too have a bearing on expression but their immediate effect is designed to be the ordering and control of ideas within the mind itself the exercises in composition may be classed as elementary or advanced according to the knowledge and experience of the pupils who undertake them they might follow a course in the elements of rhetoric but also there is no reason why they should not precede it about the publisher forgotten books publishes hundreds of thousands of rare and classic books find more at forgottenbooks com this book is a reproduction of an important historical work forgotten books uses state of the art technology to digitally reconstruct the work preserving the original format whilst repairing imperfections present in the aged copy in rare cases an imperfection in the original such as a blemish or missing page may be replicated in our edition we do however repair the vast majority of imperfections successfully any imperfections that remain are intentionally left to preserve the state of such historical works

this book offers a concise introduction to both proof theory and algebraic methods the core of the syntactic and semantic study of logic respectively the importance of combining these two has been increasingly recognized in recent years it highlights the contrasts between the deep concrete results using the former and the general abstract ones using the latter covering modal logics many valued logics superintuitionistic and substructural logics together with their algebraic semantics the book also provides an introduction to nonclassical logic for undergraduate or graduate level courses the book is divided into two parts proof theory in part i and algebra in logic in part ii part i presents sequent systems and discusses cut elimination and its applications in detail it also provides simplified proof of cut elimination making the topic more accessible the last chapter of part i is devoted to clarification of the classes of logics that are discussed in the second part part ii focuses on algebraic semantics for these logics at the same time it is a gentle introduction to the basics of algebraic logic and universal algebra with many examples of their applications in logic

part ii can be read independently of part i with only minimum knowledge required and as such is suitable as a textbook for short introductory courses on algebra in logic

this book introduces the notions and methods of formal logic from a computer science standpoint covering propositional logic predicate logic and foundations of logic programming the classic text is replete with illustrative examples and exercises it presents applications and themes of computer science research such as resolution automated deduction and logic programming in a rigorous but readable way the style and scope of the work rounded out by the inclusion of exercises make this an excellent textbook for an advanced undergraduate course in logic for computer scientists

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