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Mathematical Logic *My Best Mathematical and Logic Puzzles A Beginner's Guide to Mathematical Logic* **Mathematical Logic** An Introduction to Mathematical Logic **Classical Mathematical Logic Fundamentals of Mathematical Logic A Friendly Introduction to Mathematical Logic Mathematical Logic Mathematical Logic A Profile of Mathematical Logic Mathematical Logic An Introduction to Mathematical Logic and Type Theory** *Mathematical Logic A Course in Mathematical Logic* **The Mathematics of Logic** *A Mathematical Introduction to Logic* **Mathematical Logic** *Philosophical and Mathematical Logic* **A Concise Introduction to Mathematical Logic Introduction to Mathematical Logic** Mathematical Logic and the Foundations of Mathematics *What Is Mathematical Logic?* Foundations of Mathematical Logic Mathematical Logic **Popular Lectures on Mathematical Logic** *Mathematical Logic* Mathematical Logic for Computer Science *First Course in Mathematical Logic* Logic of Mathematics **A Course on Mathematical Logic Aspects of Mathematical Logic** *Introduction to Mathematical Logic (PMS-13), Volume 13* **Mathematics, Logic, and their Philosophies The Mathematical Analysis of Logic Problems in Set Theory, Mathematical Logic and the Theory of Algorithms Mathematical Logic and Model Theory Introduction To Mathematical Logic (Extended Edition)** *A Tour Through Mathematical Logic Introduction to Mathematical Logic*

A Mathematical Introduction to Logic, Second Edition, 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. Material is presented on computer science issues such as computational complexity and database queries, with additional coverage of introductory material such as sets. * Increased flexibility of the text, allowing instructors more choice in how they use the textbook in courses. * Reduced mathematical rigour to fit the needs of undergraduate students 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. At the intersection of mathematics, computer science, and philosophy, mathematical logic examines the power and limitations of formal mathematical thinking. In this expansion of Leary's user-friendly 1st edition, readers with no previous study in the field are introduced to the basics of model theory, proof theory, and computability theory. The text is designed to be used either in an upper division undergraduate classroom, or for self study. Updating the 1st Edition's treatment of languages, structures, and deductions, leading to rigorous proofs of Gödel's First and Second Incompleteness Theorems, the expanded 2nd Edition includes a new introduction to incompleteness through computability as well as solutions to selected exercises. 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. This introduction to first-order logic clearly works out the role of first-order logic in the foundations of mathematics, particularly the two basic questions of the range of the axiomatic method and of theorem-proving by machines. It covers several advanced topics not commonly treated in introductory texts, such as Fraïssé's characterization of elementary equivalence, Lindström's theorem on the maximality of first-order logic, and the fundamentals of logic programming. Rigorous introduction is simple enough in presentation and context for wide range of students. Symbolizing sentences; logical inference; truth and validity; truth tables; terms, predicates, universal quantifiers; universal specification and laws of identity; more. Contents include an elementary but thorough overview of mathematical logic of 1st order; formal number theory; surveys of the work by Church, Turing, and others, including Gödel's completeness theorem, Gentzen's theorem, more. Problems in Set Theory, Mathematical Logic and the Theory of Algorithms by I. Lavrov & L. Maksimova is an English translation of the fourth edition of the most popular student problem book in mathematical logic in Russian. It covers major classical topics in proof theory and the semantics of propositional and predicate logic as well as set theory and computation theory. Each chapter begins with 1-2 pages of terminology and definitions that make the book self-contained. Solutions are provided. The book is likely to become an essential part of curricula in logic. This is a compact mtroduction to some of the pnncipal tOpICS of mathematical logic . In the belief that beginners should be exposed to the most natural and easiest proofs, I have used free-swinging set-theoretic methods. The significance of a demand for constructive proofs can be evaluated only after a certain amount of experience with mathematical logic has been obtained. If we are to be expelled from "Cantor's paradise" (as nonconstructive set theory was called by Hilbert), at least we should know what we are missing. The major changes in this new edition are the following. (1) In Chapter 5, Effective Computability, Turing-computabIlity IS now the central notion, and diagrams (flow-charts) are used to construct Turing machines. There are also treatments of Markov algorithms, Herbrand-Godel-computability, register machines, and random access machines. Recursion theory is gone into a little more deeply, including the s-m-n theorem, the recursion theorem, and Rice's Theorem. (2) The proofs of the Incompleteness Theorems are now based upon the Diagonalization Lemma. Lob's Theorem and its connection with Godel's Second Theorem are also studied. (3) In Chapter 2, Quantification Theory, Henkin's proof of the completeness theorem has been postponed until the reader has gained more experience in proof techniques. The exposition of the proof itself has been improved by breaking it down into smaller pieces and using the notion of a scapegoat theory. There is also an entirely new section on semantic trees. The noted expert selects 70 of his favorite "short" puzzles, including such mind-bogglers as The Returning Explorer, The Mutilated Chessboard, Scrambled Box Tops, and dozens more involving logic and basic math. Solutions included. From the Introduction: "We shall base our discussion on a set-theoretical foundation like that used in developing analysis, or algebra, or topology. We may consider our task as that of giving a mathematical analysis of the basic concepts of logic and mathematics themselves. Thus we treat mathematical and logical practice as given empirical data and attempt to develop a purely mathematical theory of logic abstracted from these data." There are 31 chapters in 5 parts and approximately 320 exercises marked by difficulty and whether or not they are necessary for further work in the book. This introductory graduate text covers modern mathematical logic from propositional, first-order and infinitary logic and Gödel's Incompleteness Theorems to extensive introductions to set theory, model theory and recursion (computability) theory. Based on the author's more than 35 years of teaching experience, the book develops students' intuition by presenting complex ideas in the simplest context for which they make sense. The book is appropriate for use as a classroom text, for self-study, and as a reference on the state of modern logic. This classic introduction to the main areas of mathematical logic provides the basis for a first graduate course in the subject. It embodies the viewpoint that mathematical logic is not a collection of vaguely related results, but a coherent method of attacking some of the most interesting problems, which face the mathematician. The author presents the basic concepts in an unusually clear and accessible fashion, concentrating on what he views as the central topics of mathematical logic: proof theory, model theory, recursion theory, axiomatic number theory, and set theory. There are many exercises, and they provide the outline of what amounts to a second book that goes into all topics in more depth. This book has played a role in the education of many mature and accomplished researchers. This is a mathematics textbook with theorems and proofs. The choice of topics has been guided by the needs of computer science students. The method of semantic tableaux provides an elegant way to teach logic that is both theoretically sound and yet sufficiently elementary for undergraduates. In order to provide a balanced treatment of logic, tableaux are related to deductive proof systems. The book presents various logical systems and contains exercises. Still further, Prolog source code is available on an accompanying Web site. The author is an Associate Professor at the Department of Science Teaching, Weizmann Institute of Science. This undergraduate textbook covers the key material for a typical first course in logic, in particular presenting a full mathematical account of the most important result in logic, the Completeness Theorem for first-order logic.

Looking at a series of interesting systems, increasing in complexity, then proving and discussing the Completeness Theorem for each, the author ensures that the number of new concepts to be absorbed at each stage is manageable, whilst providing lively mathematical applications throughout. Unfamiliar terminology is kept to a minimum, no background in formal set-theory is required, and the book contains proofs of all the required set theoretical results. The reader is taken on a journey starting with König's Lemma, and progressing via order relations, Zorn's Lemma, Boolean algebras, and propositional logic, to completeness and compactness of first-order logic. As applications of the work on first-order logic, two final chapters provide introductions to model theory and nonstandard analysis. Logic is sometimes called the foundation of mathematics: the logician studies the kinds of reasoning used in the individual steps of a proof. Alonzo Church was a pioneer in the field of mathematical logic, whose contributions to number theory and the theories of algorithms and computability laid the theoretical foundations of computer science. His first Princeton book, The Calculi of Lambda-Conversion (1941), established an invaluable tool that computer scientists still use today. Even beyond the accomplishment of that book, however, his second Princeton book, Introduction to Mathematical Logic, defined its subject for a generation. Originally published in Princeton's Annals of Mathematics Studies series, this book was revised in 1956 and reprinted a third time, in 1996, in the Princeton Landmarks in Mathematics series. Although new results in mathematical logic have been developed and other textbooks have been published, it remains, sixty years later, a basic source for understanding formal logic. Church was one of the principal founders of the Association for Symbolic Logic; he founded the Journal of Symbolic Logic in 1936 and remained an editor until 1979 At his death in 1995, Church was still regarded as the greatest mathematical logician in the world. Noted logician discusses both theoretical underpinnings and practical applications, exploring set theory, model theory, recursion theory and constructivism, proof theory, logic's relation to computer science, and other subjects. 1981 edition, reissued by Dover in 1993 with a new Postscript by the author. In case you are considering to adopt this book for courses with over 50 students, please contact ties.nijssen@springer.com for more information. This introduction to mathematical logic starts with propositional calculus and first-order logic. Topics covered include syntax, semantics, soundness, completeness, independence, normal forms, vertical paths through negation normal formulas, compactness, Smullyan's Unifying Principle, natural deduction, cut-elimination, semantic tableaux, Skolemization, Herbrand's Theorem, unification, duality, interpolation, and definability. The last three chapters of the book provide an introduction to type theory (higher-order logic). It is shown how various mathematical concepts can be formalized in this very expressive formal language. This expressive notation facilitates proofs of the classical incompleteness and undecidability theorems which are very elegant and easy to understand. The discussion of semantics makes clear the important distinction between standard and nonstandard models which is so important in understanding puzzling phenomena such as the incompleteness theorems and Skolem's Paradox about countable models of set theory. Some of the numerous exercises require giving formal proofs. A computer program called ETPS which is available from the web facilitates doing and checking such exercises. Audience: This volume will be of interest to mathematicians, computer scientists, and philosophers in universities, as well as to computer scientists in industry who wish to use higher-order logic for hardware and software specification and verification. In Classical Mathematical Logic, Richard L. Epstein relates the systems of mathematical logic to their original motivations to formalize reasoning in mathematics. The book also shows how mathematical logic can be used to formalize particular systems of mathematics. It sets out the formalization not only of arithmetic, but also of group theory, field theory, and linear orderings. These lead to the formalization of the real numbers and Euclidean plane geometry. The scope and limitations of modern logic are made clear in these formalizations. The book provides detailed explanations of all proofs and the insights behind the proofs, as well as detailed and nontrivial examples and problems. The book has more than 550 exercises. It can be used in advanced undergraduate or graduate courses and for self-study and reference. Classical Mathematical Logic presents a unified treatment of material that until now has been available only by consulting many different books and research articles, written with various notation systems and axiomatizations. 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. At each stage of the text, the reader is given an intuition based on standard mathematical practice, which is subsequently developed with clean formal mathematics. Alongside the practical examples, readers learn what can and can't be calculated; for example the correctness of a derivation proving a given sequent can be tested mechanically, but there is no general mechanical test for the existence of a derivation proving the given sequent. The undecidability results are proved rigorously in an optional final chapter, assuming Matiyasevich's theorem characterising the computably enumerable relations. Rigorous proofs of the adequacy and completeness proofs of the relevant logics are provided, with careful attention to the languages involved. Optional sections discuss the classification of mathematical structures by first-order theories; the required theory of cardinality is developed from scratch. Throughout the book there are notes on historical aspects of the material, and connections with linguistics and computer science, and the discussion of syntax and semantics is influenced by modern linguistic approaches. Two basic themes in recent cognitive science studies of actual human reasoning are also introduced. Including extensive exercises and selected solutions, this text is ideal for students in Logic, Mathematics, Philosophy, and Computer Science. 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 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. Anyone seeking a readable and relatively brief guide to logic can do no better than this classic introduction. A treat for both the intellect and the imagination, it profiles the development of logic from ancient to modern times and compellingly examines the nature of logic and its philosophical implications. No prior knowledge of logic is necessary; readers need only an acquaintance with high school mathematics. The author emphasizes understanding, rather than technique, and focuses on such topics as the historical reasons for the formation of Aristotelian logic, the rise of mathematical logic after more than 2,000 years of traditional logic, the nature of the formal axiomatic method and the reasons for its use, and the main results of metatheory and their philosophic import. The treatment of the Gödel metatheorems is especially detailed and clear, and answers to the problems appear at the end. 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 mathematically minded readers. Dover (2014) original publication. See every Dover book in print at www.doverpublications.com A Tour Through Mathematical Logic provides a tour through the main branches of the foundations of mathematics. It contains chapters covering elementary logic, basic set theory, recursion theory, Gödel's (and others') incompleteness theorems, model theory, independence results in set theory, nonstandard analysis, and constructive mathematics. In addition, this monograph discusses several topics not normally found in books of this type, such as fuzzy logic, nonmonotonic logic, and complexity theory. This book, presented in two parts, offers a slow introduction to mathematical logic, and several basic concepts of model theory, such as first-order definability, types, symmetries, and elementary extensions. Its first part, Logic Sets, and Numbers, shows how mathematical logic is used to develop the number structures of classical mathematics. The exposition does not assume any prerequisites; it is rigorous, but as informal as possible. All necessary concepts are introduced exactly as they would be in a course in mathematical logic; but are accompanied by more extensive introductory remarks and examples to motivate formal developments. The second part, Relations, Structures, Geometry, introduces several basic concepts of model theory, such as first-order definability, types, symmetries, and elementary extensions, and shows how they are used to study and classify mathematical structures. Although more advanced, this second part is accessible to the reader who is either already familiar with basic mathematical logic, or has carefully read the first part of the book. Classical developments in model theory, including the Compactness Theorem and its uses, are discussed. Other topics include tameness, minimality, and order minimality of structures. The book can be used as an introduction to model theory, but unlike standard texts, it does not require familiarity with abstract algebra. This book will also be of interest to mathematicians who know the technical aspects of the subject, but are not familiar with its history and philosophical background. This volume is a collection of essays in honour of Professor Mohammad Ardeshir. It examines topics which, in one way or another, are connected to the various aspects of his multidisciplinary research interests. Based on this criterion, the book is divided into three general categories. The first category includes papers on non-classical logics, including intuitionistic logic, constructive logic, basic logic, and substructural logic. The second category is made up of papers discussing issues in the contemporary philosophy of mathematics and logic. The third category contains papers on Avicenna’s logic and philosophy. Mohammad Ardeshir is a full professor of mathematical logic at the Department of Mathematical Sciences, Sharif University of Technology, Tehran, Iran, where he has taught generations of students for around a quarter century. Mohammad Ardeshir is known in the first place for his prominent works in basic logic and constructive mathematics. His areas of interest are however much broader and include topics in intuitionistic philosophy of mathematics and Arabic philosophy of logic and mathematics. In addition to numerous research articles in leading international journals, Ardeshir is the author of a highly praised Persian textbook in mathematical logic. Partly through his writings and translations, the school of mathematical intuitionism was introduced to the Iranian academic community. Mathematical Logic is a collection of the works of one of the leading figures in 20th-century science. This collection of A.M. Turing's works is intended to include all his mature scientific writing, including a substantial quantity of unpublished material. His work in pure mathematics and mathematical logic extended considerably further; the work of his last years, on morphogenesis in plants, is also of the greatest originality and of permanent importance. This book is divided into three parts. The first part focuses on computability and ordinal logics and covers Turing's work between 1937 and 1938. The second part covers type theory; it provides a general introduction to Turing's work on type theory and covers his published and unpublished works between 1941 and 1948. Finally, the third part focuses on enigmas, mysteries, and loose ends. This concluding section of the book discusses Turing's Treatise on the Enigma, with excerpts from the Enigma Paper. It also delves into Turing's papers on programming and on minimum cost sequential analysis, featuring an excerpt from the unpublished manuscript. This book will be of interest to mathematicians, logicians, and computer scientists. This is a systematic and well-paced introduction to mathematical logic. Excellent as a course text, the book presupposes only elementary background and can be used also for self-study by more ambitious students.Starting with the basics of set theory, induction and computability, it covers propositional and first order logic — their syntax, reasoning systems and semantics. Soundness and completeness results for Hilbert's and Gentzen's systems are presented, along with simple decidability arguments. The general applicability of various concepts and techniques is demonstrated by highlighting their consistent reuse in different contexts.Unlike in most comparable texts, presentation of syntactic reasoning systems precedes the semantic explanations. The simplicity of syntactic constructions and rules — of a high, though often neglected, pedagogical value — aids students in approaching more complex semantic issues. This order of presentation also brings forth the relative independence of syntax from the semantics, helping to appreciate the importance of the purely symbolic systems, like those underlying computers.An overview of the history of logic precedes the main text, while informal analogies precede introduction of most central concepts. These informal aspects are kept clearly apart from the technical ones. Together, they form a unique text which may be appreciated equally by lecturers and students occupied with mathematical precision, as well as those interested in the relations of logical formalisms to the problems of computability and the philosophy of logic.This revised edition contains also, besides many new exercises, a new chapter on semantic paradoxes. An equivalence of logical and graphical representations allows us to see vicious circularity as the odd cycles in the graphical representation and can be used as a simple tool for diagnosing paradoxes in natural discourse. This comprehensive overview ofmathematical logic is designedprimarily for advanced undergraduatesand graduate studentsof mathematics. The treatmentalso contains much of interest toadvanced students in computerscience and philosophy. Topics include propositional logic;first-order languages and logic; incompleteness, undecidability,and indefinability; recursive functions; computability;and Hilbert’s Tenth Problem.Reprint of the PWS Publishing Company, Boston, 1995edition. Mathematical Logic and Model Theory: A Brief Introduction offers a streamlined yet easy-to-read introduction to mathematical logic and basic model theory. It presents, in a self-contained manner, the essential aspects of model theory needed to understand model theoretic algebra. As a profound application of model theory in algebra, the last part of this book develops a complete proof of Ax and Kochen's work on Artin's conjecture about Diophantine properties of p-adic number fields. The character of model theoretic constructions and results differ quite significantly from that commonly found in algebra, by the treatment of formulae as mathematical objects. It is therefore indispensable to first become familiar with the problems and methods of mathematical logic. Therefore, the text is divided into three parts: an introduction into mathematical logic (Chapter 1), model theory

(Chapters 2 and 3), and the model theoretic treatment of several algebraic theories (Chapter 4). This book will be of interest to both advanced undergraduate and graduate students studying model theory and its applications to algebra. It may also be used for self-study. Mathematical logic developed into a broad discipline with many applications in mathematics, informatics, linguistics and philosophy. This text introduces the fundamentals of this field, and this new edition has been thoroughly expanded and revised. Written by a pioneer of mathematical logic, this comprehensive graduate-level text explores the constructive theory of first-order predicate calculus. It covers formal methods — including algorithms and epitheory — and offers a brief treatment of Markov's approach to algorithms. It also explains elementary facts about lattices and similar algebraic systems. 1963 edition. H. Hermes: Basic notions and applications of the theory of decidability.- D. Kurepa: On several continuum hypotheses.- A. Mostowski: Models of set theory.- A. Robinson: Problems and methods of model theory.- S. Sochor, B. Balcar: The general theory of semisets. Syntactic models of the set theory. 1. This book is above all addressed to mathematicians. It is intended to be a textbook of mathematical logic on a sophisticated level, presenting the reader with several of the most significant discoveries of the last ten or fifteen years. These include: the independence of the continuum hypothe sis, the Diophantine nature of enumerable sets, the impossibility of finding an algorithmic solution for one or two old problems. All the necessary preliminary material, including predicate logic and the fundamentals of recursive function theory, is presented systematically and with complete proofs. We only assume that the reader is familiar with "naive" set theoretic arguments. In this book mathematical logic is presented both as a part of mathe matics and as the result of its self-perception. Thus, the substance of the book consists of difficult proofs of subtle theorems, and the spirit of the book consists of attempts to explain what these theorems say about the mathematical way of thought. Foundational problems are for the most part passed over in silence. Most likely, logic is capable of justifying mathematics to no greater extent than biology is capable of justifying life. 2. The first two chapters are devoted to predicate logic. The presenta tion here is fairly standard, except that semantics occupies a very domi nant position, truth is introduced before deducibility, and models of speech in formal languages precede the systematic study of syntax. A comprehensive and user-friendly guide to the use of logic inmathematical reasoning Mathematical Logic presents a comprehensive introductionto formal methods of logic and their use as a reliable tool fordeductive reasoning. With its user-friendly approach, this booksuccessfully equips readers with the key concepts and methods forformulating valid mathematical arguments that can be used touncover truths across diverse areas of study such as mathematics,computer science, and philosophy. The book develops the logical tools for writing proofs byguiding readers through both the established "Hilbert" style ofproof writing, as well as the "equational" style that is emergingin computer science and engineering applications. Chapters havebeen organized into the two topical areas of Boolean logic andpredicate logic. Techniques situated outside formal logic areapplied to illustrate and demonstrate significant facts regardingthe power and limitations of logic, such as: Logic can certify truths and only truths. Logic can certify all absolute truths (completeness theorems ofPost and Gödel). Logic cannot certify all "conditional" truths, such as thosethat are specific to the Peano arithmetic. Therefore, logic hassome serious limitations, as shown through Gödel'sincompleteness theorem. Numerous examples and problem sets are provided throughout thetext, further facilitating readers' understanding of thecapabilities of logic to discover mathematical truths. In addition,an extensive appendix introduces Tarski semantics and proceeds withdetailed proofs of completeness and first incompleteness theorems,while also providing a self-contained introduction to the theory ofcomputability. With its thorough scope of coverage and accessible style,Mathematical Logic is an ideal book for courses inmathematics, computer science, and philosophy at theupper-undergraduate and graduate levels. It is also a valuablereference for researchers and practitioners who wish to learn howto use logic in their everyday work. A serious introductory treatment geared toward non-logicians, this survey traces the development of mathematical logic from ancient to modern times and discusses the work of Planck, Einstein, Bohr, Pauli, Heisenberg, Dirac, and others. 1972 edition. A thorough, accessible, and rigorous presentation of the centraltheorems of mathematical logic . . . ideal for advanced students ofmathematics, computer science, and logic Logic of Mathematics combines a full-scale introductory course inmathematical logic and model theory with a range of speciallyselected, more advanced theorems. Using a strict mathematicalapproach, this is the only book available that contains completeand precise proofs of all of these important theorems: * Gödel's theorems of completeness and incompleteness * The independence of Goodstein's theorem from Peanoarithmetic * Tarski's theorem on real closed fields * Matiyasevich's theorem on diophantine formulas Logic of Mathematics also features: * Full coverage of model theoretical topics such as definability,compactness, ultraproducts, realization, and omission oftypes * Clear, concise explanations of all key concepts, from Booleanalgebras to Skolem-Löwenheim constructions and othertopics * Carefully chosen exercises for each chapter, plus helpfulsolution hints At last, here is a refreshingly clear, concise, and mathematicallyrigorous presentation of the basic concepts of mathematicallogic-requiring only a standard familiarity with abstract algebra.Employing a strict mathematical approach that emphasizes relationalstructures over logical language, this carefully organized text isdivided into two parts, which explain the essentials of the subjectin specific and straightforward terms. Part I contains a thorough introduction to mathematical logic andmodel theory-including a full discussion of terms, formulas, andother fundamentals, plus detailed coverage of relational structuresand Boolean algebras, Gödel's completeness theorem, models ofPeano arithmetic, and much more. Part II focuses on a number of advanced theorems that are centralto the field, such as Gödel's first and second theorems ofincompleteness, the independence proof of Goodstein's theorem fromPeano arithmetic, Tarski's theorem on real closed fields, andothers. No other text contains complete and precise proofs of allof these theorems. With a solid and comprehensive program of exercises and selectedsolution hints, Logic of Mathematics is ideal for classroom use-theperfect textbook for advanced students of mathematics, computerscience, and logic. Ideal for students intending to specialize in the topic. Part I discusses traditional and symbolic logic. Part II explores the foundations of mathematics. Part III focuses on the philosophy of mathematics.