# {Download PDF} Symbolic Logic And Mechanical Theorem Proving

## Wolfgang Bibel

A Survey of Symbolic Logic Clarence Irving Lewis,1918

**Symbolic Logic** Dale Jacquette,2001 This comprehensive intro text covers central topics of elementary and symbolic logic. It contains many problems and exercises and provides a solid foundation for continued study of advanced topics in logic.

**Concepts of Proof in Mathematics, Philosophy, and Computer Science** Dieter Probst,Peter Schuster,2016-07-25 A proof is a successful demonstration that a conclusion necessarily follows by logical reasoning from axioms which are considered evident for the given context and agreed upon by the community. It is this concept that sets mathematics apart from other disciplines and distinguishes it as the prototype of a deductive science. Proofs thus are utterly relevant for research, teaching and communication in mathematics and of particular interest for the philosophy of mathematics. In computer science, moreover, proofs have proved to be a rich source for already certified algorithms. This book provides the reader with a collection of articles covering relevant current research topics circled around the concept 'proof'. It tries to give due consideration to the depth and breadth of the subject by discussing its philosophical and methodological aspects, addressing foundational issues induced by Hilbert's Programme and the benefits of the arising formal notions of proof, without neglecting reasoning in natural language proofs and applications in computer science such as program extraction.

Symbolic Logic and Mechanical Theorem Proving Jinliang Zhang,1973

**Symbolic Logic** Odysseus Makridis,2022 This book provides a comprehensive introduction to the essential elements of standard (classical) symbolic logic. Key topics covered include: · The characteristic nature and scope of logic as a discipline · The construction of a series of distinctly named formal languages suitable for formal translation · Semantic models · The construction of decision procedures · The execution of proof-theoretic arrangements like natural deduction and proof-sequent systems The book covers both the semantics and proof theory of the standard sentential (propositional) logic and predicate (first-order) logic. Other topics covered include: parsing trees, extraction of alternative notations (for instance, Polish notation), Fitch-style proof-theory, sequent and 'tree' proof systems, comparisons and contrasts with intuitionistic logic, and

presentations of predicate logic models. An ancillary chapter on elements of set theory is conveniently placed at the end and includes insights into the Zermelo-Fraenkel systematization of set theory. The philosophy of logic is also explored. Exercises in the text provide instruction on mathematical induction for the construction of formula, tests for the well-formedness of Polish notation, and functional completeness. Symbolic Logic is essential reading for all philosophy students taking intermediate level formal logic courses and will also appeal to diligent first year students of logic. The text is replete with exercises on both the formal machinery and the philosophical aspects of logic.

**Mathematical Logic and Its Applications** Dimiter G. Skordev,2012-12-06 The Summer School and Conference on Mathematical Logic and its Applications, September 24 - October 4, 1986, Druzhba, Bulgaria, was honourably dedicated to the 80-th anniversary of Kurt Godel (1906 - 1978), one of the greatest scientists of this (and not only of this) century. The main topics of the Meeting were: Logic and the Foundation of Mathematics; Logic and Computer Science; Logic, Philosophy, and the Study of Language; Kurt Godel's life and deed. The scientific program comprised 5 kinds of activities, namely: a) a Godel Session with 3 invited lecturers b) a Summer School with 17 invited lecturers c) a Conference with 13 contributed talks d) Seminar talks (one invited and 12 with no preliminary selection) e) three discussions The present volume reflects an essential part of this program, namely 14 of the invited lectures and all of the contributed talks. Not presented in the volltme remai ned si x of the i nvi ted lecturers who di d not submi t texts: Yu. Ershov - The Language of!:-expressions and its Semantics; S. Goncharov - Mathematical Foundations of Semantic Programming; Y. Moschovakis - Foundations of the Theory of Algorithms; N. Nagornyj - Is Realizability of Propositional Formulae a GBdelean Property; N. Shanin - Some Approaches to Finitization of Mathematical Analysis; V. Uspensky - Algorithms and Randomness - joint with A.N.

*An Introduction to Symbolic Logic* Langer,1967-01-01 Famous classic has introduced countless readers to symbolic logic with its thorough and precise exposition. Starts with simple symbols and conventions and concludes with the Boole-Schroeder and Russell-Whitehead systems. No special knowledge of mathematics necessary. One of the clearest and simplest introductions to a subject which is very much alive. — Mathematics Gazette.

**Proof Theory and Automated Deduction** Jean Goubault-Larrecq,I. Mackie,2001-11-30 Interest in computer applications has led to a new attitude to applied logic in which researchers tailor a logic in the same way they define a computer language. In response to this attitude, this text for undergraduate and graduate students discusses major algorithmic methodologies, and tableaux and resolution methods. The authors focus on first-order logic, the use of proof theory, and the computer application of automated searches for proofs of mathematical propositions. Annotation copyrighted by Book News, Inc., Portland, OR

*A Short Introduction to Intuitionistic Logic* Grigori Mints,2006-04-11 Intuitionistic logic is presented here as part of familiar classical logic which allows mechanical extraction of programs from proofs. to make the material more accessible,

basic techniques are presented first for propositional logic; Part II contains extensions to predicate logic. This material provides an introduction and a safe background for reading research literature in logic and computer science as well as advanced monographs. Readers are assumed to be familiar with basic notions of first order logic. One device for making this book short was inventing new proofs of several theorems. The presentation is based on natural deduction. The topics include programming interpretation of intuitionistic logic by simply typed lambda-calculus (Curry-Howard isomorphism), negative translation of classical into intuitionistic logic, normalization of natural deductions, applications to category theory, Kripke models, algebraic and topological semantics, proof-search methods, interpolation theorem. The text developed from materal for several courses taught at Stanford University in 1992-1999.

*Logic for Computer Science* Jean H. Gallier,2015-06-18 This advanced text for undergraduate and graduate students introduces mathematical logic with an emphasis on proof theory and procedures for algorithmic construction of formal proofs. The self-contained treatment is also useful for computer scientists and mathematically inclined readers interested in the formalization of proofs and basics of automatic theorem proving. Topics include propositional logic and its resolution, first-order logic, Gentzen's cut elimination theorem and applications, and Gentzen's sharpened Hauptsatz and Herbrand's theorem. Additional subjects include resolution in first-order logic; SLD-resolution, logic programming, and the foundations of PROLOG; and many-sorted first-order logic. Numerous problems appear throughout the book, and two Appendixes provide practical background information.

*STACS 94* Patrice Enjalbert,Ernst W. Mayr,Klaus W. Wagner,1994-02-09 This volume constitutes the proceedings of the 11th annual Symposium on Theoretical Aspects of Computer Science (STACS '94), held in Caen, France, February 24-26, 1994. Besides three prominent invited papers, the proceedings contains 60 accepted contributions chosen by the international program committee during a highly competitive reviewing process from a total of 234 submissions for 38 countries. The volume competently represents most areas of theoretical computer science with a certain emphasis on (parallel) algorithms and complexity.

**Mechanical Theorem Proving in Geometries** Wen-tsün Wu,2012-12-06 There seems to be no doubt that geometry originates from such practical activ ities as weather observation and terrain survey. But there are different manners, methods, and ways to raise the various experiences to the level of theory so that they finally constitute a science. F. Engels said, The objective of mathematics is the study of space forms and quantitative relations of the real world. Dur ing the time of the ancient Greeks, there were two different methods dealing with geometry: one, represented by the Euclid's Elements, purely pursued the logical relations among geometric entities, excluding completely the quantita tive relations, as to establish the axiom system of geometry. This method has become a model of deduction methods in mathematics. The other, represented by the relevant work of Archimedes, focused on the study of quantitative re lations of geometric objects as well

as their measures such as the ratio of the circumference of a circle to its diameter and the area of a spherical surface and of a parabolic sector. Though these approaches vary in style, have their own features, and reflect different viewpoints in the development of geometry, both have made great contributions to the development of mathematics. The development of geometry in China was all along concerned with quanti tative relations.

Computational Logic and Proof Theory Georg Gottlob,Alexander Leitsch,Daniele Mundici,1997-08-13 This book constitutes the refereed proceedings of the 5th Kurt Gödel Colloquium on Computational Logic and Proof Theory, KGC '97, held in Vienna, Austria, in August 1997. The volume presents 20 revised full papers selected from 38 submitted papers. Also included are seven invited contributions by leading experts in the area. The book documents interdisciplinary work done in the area of computer science and mathematical logics by combining research on provability, analysis of proofs, proof search, and complexity.

A Computational Logic Robert S. Boyer,J Strother Moore,2014-06-25 ACM Monograph Series: A Computational Logic focuses on the use of induction in proving theorems, including the use of lemmas and axioms, free variables, equalities, and generalization. The publication first elaborates on a sketch of the theory and two simple examples, a precise definition of the theory, and correctness of a tautology-checker. Topics include mechanical proofs, informal development, formal specification of the problem, well-founded relations, natural numbers, and literal atoms. The book then examines the use of type information to simplify formulas, use of axioms and lemmas as rewrite rules, and the use of definitions. Topics include nonrecursive functions, computing values, free variables in hypothesis, infinite backwards chaining, infinite looping, computing type sets, and type prescriptions. The manuscript takes a look at rewriting terms and simplifying clauses, eliminating destructors and irrelevance, using equalities, and generalization. Concerns include reasons for eliminating isolated hypotheses, precise statement of the generalization heuristic, restricting generalizations, precise use of equalities, and multiple destructors and infinite looping. The publication is a vital source of data for researchers interested in computational logic.

*Handbook of Practical Logic and Automated Reasoning* John Harrison,2009-03-12 A one-stop reference, self-contained, with theoretical topics presented in conjunction with implementations for which code is supplied.

Theorem Proving with Analytic Tableaux and Related Methods Peter Baumgartner,Reiner Ha hnle,Joachim Posegga,1995-04-26 This volume constitutes the proceedings of the 4th International Workshop on Theorem Proving with Analytic Tableaux and Related Methods, TABLEAU '95, held at Schloß Rheinfels, St. Goar, Germany in May 1995. Originally tableau calculi and their relatives were favored primarily as a pedagogical device because of their advantages at the presentation level. The 23 full revised papers in this book bear witness that these methods have now gained fundamental importance in theorem proving, particularly as competitors for resolution methods. The book is organized in sections on

extensions, modal logic, intuitionistic logic, the connection method and model elimination, non-clausal proof procedures, linear logic, higher-order logic, and applications

**Proofs and Computations** Helmut Schwichtenberg,Stanley S. Wainer,2011-12-15 Driven by the question, 'What is the computational content of a (formal) proof?', this book studies fundamental interactions between proof theory and computability. It provides a unique self-contained text for advanced students and researchers in mathematical logic and computer science. Part I covers basic proof theory, computability and Gödel's theorems. Part II studies and classifies provable recursion in classical systems, from fragments of Peano arithmetic up to Π11–CA0. Ordinal analysis and the (Schwichtenberg–Wainer) subrecursive hierarchies play a central role and are used in proving the 'modified finite Ramsey' and 'extended Kruskal' independence results for PA and Π11–CA0. Part III develops the theoretical underpinnings of the first author's proof assistant MINLOG. Three chapters cover higher-type computability via information systems, a constructive theory TCF of computable functionals, realizability, Dialectica interpretation, computationally significant quantifiers and connectives and polytime complexity in a two-sorted, higher-type arithmetic with linear logic.

**Using Sophisticated Models in Resolution Theorem Proving** David M. Sandford,1980-08

**Symbolic Logic and Mechanical Theorem Proving** Chin-Liang Chang,Richard Char-Tung Lee,2014-06-28 This book contains an introduction to symbolic logic and a thorough discussion of mechanical theorem proving and its applications. The book consists of three major parts. Chapters 2 and 3 constitute an introduction to symbolic logic. Chapters 4-9 introduce several techniques in mechanical theorem proving, and Chapters 10 an 11 show how theorem proving can be applied to various areas such as question answering, problem solving, program analysis, and program synthesis.

**From Symbolic Logic-- to Mathematical Logic** Charles L. Silver,1994 This text aims to unify mathematical logic and symbolic logic, and outlines how mathematical logic emerged from symbolic logic. Derivations are extended to encompass mathematical principles. Godel's theorems are covered, including philosophical and historical issues.

Mathematical Logic Daniel Cunningham,2023-05-22 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.

A Computational Logic Handbook Robert S. Boyer,J Strother Moore,2014-05-10 Perspectives in Computing: A Computational Logic Handbook contains a precise description of the logic and a detailed reference guide to the associated mechanical theorem proving system, including a primer for the logic as a functional programming language, an introduction to proofs in the logic, and a primer for the mechanical theorem. The publication first offers information on a primer for the logic, formalization within the logic, and a precise description of the logic. Discussions focus on induction and recursion, quantification, explicit value terms, dealing with features and omissions, elementary mathematical relationships, Boolean operators, and conventional data structures. The text then takes a look at proving theorems in the logic, mechanized proofs in the logic, and an introduction to the system. The text examines the processes involved in using the theorem prover, four classes of rules generated from lemmas, and aborting or interrupting commands. Topics include executable counterparts, toggle, elimination of irrelevancy, heuristic use of equalities, representation of formulas, type sets, and the crucial check points in a proof attempt. The publication is a vital reference for researchers interested in computational logic.

**Automated Theorem Proving: A Logical Basis** D.W. Loveland,2016-08-19 Automated Theorem Proving: A Logical Basis

**A Logical Introduction to Proof** Daniel W. Cunningham,2012-09-19 The book is intended for students who want to learn how to prove theorems and be better prepared for the rigors required in more advance mathematics. One of the key components in this textbook is the development of a methodology to lay bare the structure underpinning the construction of a proof, much as diagramming a sentence lays bare its grammatical structure. Diagramming a proof is a way of presenting the relationships between the various parts of a proof. A proof diagram provides a tool for showing students how to write correct mathematical proofs.

*Mechanical Theorem Proving in Geometries* Wen-tsun Wu,X. Jin,D. Wang,1994-04-14

*First Order Mathematical Logic* Angelo Margaris,1990-01-01 Attractive and well-written introduction. — Journal of Symbolic Logic The logic that mathematicians use to prove their theorems is itself a part of mathematics, in the same way that algebra, analysis, and geometry are parts of mathematics. This attractive and well-written introduction to mathematical logic is aimed primarily at undergraduates with some background in college-level mathematics; however, little or no acquaintance with abstract mathematics is needed. Divided into three chapters, the book begins with a brief encounter of naïve set theory and logic for the beginner, and proceeds to set forth in elementary and intuitive form the themes developed formally and in detail later. In Chapter Two, the predicate calculus is developed as a formal axiomatic theory. The statement calculus, presented as a part of the predicate calculus, is treated in detail from the axiom schemes through the deduction theorem to the completeness theorem. Then the full predicate calculus is taken up again, and a smooth-running technique for

proving theorem schemes is developed and exploited. Chapter Three is devoted to first-order theories, i.e., mathematical theories for which the predicate calculus serves as a base. Axioms and short developments are given for number theory and a few algebraic theories. Then the metamathematical notions of consistency, completeness, independence, categoricity, and decidability are discussed, The predicate calculus is proved to be complete. The book concludes with an outline of Godel's incompleteness theorem. Ideal for a one-semester course, this concise text offers more detail and mathematically relevant examples than those available in elementary books on logic. Carefully chosen exercises, with selected answers, help students test their grasp of the material. For any student of mathematics, logic, or the interrelationship of the two, this book represents a thought-provoking introduction to the logical underpinnings of mathematical theory. An excellent text. — Mathematical Reviews

First-Order Logic and Automated Theorem Proving Melvin Fitting,2012-12-06 There are many kinds of books on formal logic. Some have philosophers as their intended audience, some mathematicians, some computer scien tists. Although there is a common core to all such books, they will be very different in emphasis, methods, and even appearance. This book is intended for computer scientists. But even this is not precise. Within computer science formal logic turns up in a number of areas, from pro gram verification to logic programming to artificial intelligence. This book is intended for computer scientists interested in automated theo rem proving in classical logic. To be more precise yet, it is essentially a theoretical treatment, not a how-to book, although how-to issues are not neglected. This does not mean, of course, that the book will be of no interest to philosophers or mathematicians. It does contain a thorough presentation of formal logic and many proof techniques, and as such it contains all the material one would expect to find in a course in formal logic covering completeness but, not incompleteness issues. The first item to be addressed is, What are we talking about and why are we interested in it? We are primarily talking about truth as used in mathematical discourse, and our interest in it is, or should be, self evident. Truth is a semantic concept, so we begin with models and their properties. These are used to define our subject.

**An Introduction to Mathematical Logic and Type Theory** Peter Bruce Andrews,1986

*Symbolic Logic* David W. Agler,2013 Brimming with visual examples of concepts, derivation rules, and proof strategies, this introductory text is ideal for students with no previous experience in logic. Students will learn translation both from formal language into English and from English into formal language; how to use truth trees and truth tables to test propositions for logical properties; and how to construct and strategically use derivation rules in proofs.

**Direct and Converse Theorems** I. S. Gradshtein,2014-05-16 Direct and Converse Theorems: The Elements of Symbolic Logic, Third Edition explains the logical relations between direct, converse, inverse, and inverse converse theorems, as well as the concept of necessary and sufficient conditions. This book consists of two chapters. The first chapter is devoted to the

question of negation. Connected with the question of the negation of a proposition are interrelations of the direct and converse and also of the direct and inverse theorems; the interrelations of necessary and sufficient conditions; and the definition of the locus of a point. The second chapter explains several questions of mathematical logic–a science that is being developed in connection with the theory of mathematical proof. This edition is provided with a large number of problems and questions to help easily understand the material. The book is intended for students studying mathematics, specifically at intermediate colleges of various types. The text is also a useful reference for university students and teachers.

**Logic Programming** Jan Maluszynski,1997-10-10 The themes of the 1997 conference are new theoretical and practical accomplishments in logic programming, new research directions where ideas originating from logic programming can play a fundamental role, and relations between logic programming and other fields of computer science. The annual International Logic Programming Symposium, traditionally held in North America, is one of the main international conferences sponsored by the Association of Logic Programming. The themes of the 1997 conference are new theoretical and practical accomplishments in logic programming, new research directions where ideas originating from logic programming can play a fundamental role, and relations between logic programming and other fields of computer science. Topics include theoretical foundations, constraints, concurrency and parallelism, deductive databases, language design and implementation, nonmonotonic reasoning, and logic programming and the Internet.

Theorem Proving with Analytic Tableaux and Related Methods P. Miglioli,1996-04-24 This books presents the refereed proceedings of the Fifth International Workshop on Analytic Tableaux and Related Methods, TABLEAUX '96, held in Terrasini near Palermo, Italy, in May 1996. The 18 full revised papers included together with two invited papers present state-of-the-art results in this dynamic area of research. Besides more traditional aspects of tableaux reasoning, the collection also contains several papers dealing with other approaches to automated reasoning. The spectrum of logics dealt with covers several nonclassical logics, including modal, intuitionistic, many-valued, temporal and linear logic.

*Symbolic Logic* Irving M. Copi,1979 For courses in Formal Logic. The general approach of this book to logic remains the same as in earlier editions. Following Aristotle, we regard logic from two different points of view: on the one hand, logic is an instrument or organon for appraising the correctness of reasoning; on the other hand, the principles and methods of logic used as organon are interesting and important topics to be themselves systematically investigated.

**Automated Theorem Proving** Wolfgang Bibel,2013-06-29 Since both the coments and the structure of the book appeared to be successful, only minor changes were made. In particular, some recent work in ATP has been incorporated so that the book continues to reflect the state of the art in the field. The most significant change is in the quality of the layout including the removal of a number of inaccuracies and typing errors. R. Caferra, E. Eder, F. van der Linden, and J. Muller have caught vanous minor errors. P. Haddawy and S.T. Pope have provided many stilistic improvements of the English text.

Last not least, A. Bentrup and W. Fischer have produced the beautiful layout. The extensive work of typesetting was financally supported within ESPRIT pro ject 415. Munchen, September 1986 W. Bibel PREFACE Among the dreams of mankind is the one dealing with the mechanization of human thought. As the world today has become so complex that humans apparently fail to manage it properly with their intellectual gifts, the realization of this dream might be regarded even as something like a necessity. On the other hand, the incredi ble advances in computer technology let it appear as a real possibility.

**Mathematical Logic** Ian Chiswell,Wilfrid Hodges,2007-05-17 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 becalculated; 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, assumingMatiyasevich'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 andcomputer 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.

**Proof Complexity** Jan Krajíček,2019-03-28 Proof complexity is a rich subject drawing on methods from logic, combinatorics, algebra and computer science. This self-contained book presents the basic concepts, classical results, current state of the art and possible future directions in the field. It stresses a view of proof complexity as a whole entity rather than a collection of various topics held together loosely by a few notions, and it favors more generalizable statements. Lower bounds for lengths of proofs, often regarded as the key issue in proof complexity, are of course covered in detail. However, upper bounds are not neglected: this book also explores the relations between bounded arithmetic theories and proof systems and how they can be used to prove upper bounds on lengths of proofs and simulations among proof systems. It goes on to discuss topics that transcend specific proof systems, allowing for deeper understanding of the fundamental problems of the subject.

**Mathematical Logic** Joseph R. Shoenfield,2018-05-02 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.

*Advances in Logic, Artificial Intelligence and Robotics* Jair Minoro Abe,J. I. Da Silva Filho,2002 Logic (both Classical and Non-Classical) is being increasingly related with other fields in almost every scientific discipline and human activity. In this volume we have emphasized its role in the following fields of science: Artificial Intelligence, Robotics, Informatics in general, Technology, and correlated themes. The papers are written by some of the most prominent scientists of today.

Automated Theorem Proving: After 25 Years W. W. Bledsoe,American Mathematical Society. Meeting,1984

**Introduction to Mathematical Logic** Elliot Mendelsohn,2012-12-06 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.

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