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Functional Equations, Inequalities and Applications An Introduction to the Theory of Functional Equations and Inequalities Functional Equations and Inequalities in Several Variables College Algebra Inequalities Involving Functions and Their Integrals and Derivatives Functional Equations and Inequalities Linear Equations, Inequalities, and Functions Advances in Mathematical Inequalities and Applications Inequalities for Finite Difference Equations Intermediate Algebra 2e Handbook of Functional Equations Helping Students Understand Algebra II, Grades 7 - 8 Algebra II Practice Book, Grades 7 - 8 A Program in Contemporary Algebra: Quadratic equations and inequalities, functions and relations Functional Equations and Inequalities with Applications Beginning and Intermediate Algebra Integral Inequalities on Time Scales Equations, Inequalities, & Vic's Math Common Core Algebra 1 College Algebra CK-12 Basic Algebra, Volume 1 Of 2 COLLEGE ALGEBRA, Vol. 2 Introductory and Intermediate Algebra Differential and Integral Inequalities: Theory and Applications Functional Equations and Inequalities Multidimensional Integral Equations and Inequalities Integral and Discrete Inequalities and Their Applications Integral and Discrete Inequalities and Their Applications Algebra and Trigonometry I Essentials College Algebra Equations and Answers Experiencing Algebra Pre-calculus Mathskills Algebra Algebra Review Frontiers in Functional Equations and Analytic Inequalities Intermediate Algebra Introductory Algebra Thomas Harriot's Artis Analyticae Praxis Inequality Problems in Mechanics and Applications Introductory Mathematical Analysis

Topics covered include: Algebraic Expressions & Properties Reasoning with Quantities Writing Equations Solving Equations & Literal Equations Writing & Solving Inequalities Functions & Functions on the Coordinate Plane Linear Functions Arithmetic Sequences Linear Inequalities Systems of Equations Exponents & Exponential Functions Polynomials Quadratic Functions & Equations Data Displays Measures of Center & Spread Two-Way Frequency Tables Scatter Plots & Lines of Fit 5 strategy books: Equations, inequalities, & vic's. Fractions, decimals, & Percents. Geometry. Number properties. World translations. MathSkills reinforces math in three key areas: pre-algebra, geometry, and algebra. These titles supplement any math textbook. Reproducible pages can be used in the classroom as lesson previews or reviews. The activities are also perfect for homework or end-of-unit quizzes. Units include: Number Sense, Expressions and Equations, More Equations, Inequalities, and Functions, Lines and the Coordinate Plane, Radicals, Roots, and Right Triangles, Operations with Polynomials, Systems, Quadratic Equations, and Exponential Functions, Powers and Rational Expressions, Probability, Statistics, and Matrices. Get all you need to know with Super Reviews! Each Super Review is packed with in-depth, student-friendly topic reviews that fully explain everything about the subject. The Pre-Calculus Super Review includes sets, numbers, operations and properties, coordinate geometry, fundamental algebraic topics, solving equations and inequalities, functions, trigonometry, exponents and logarithms, conic sections, matrices, and determinants. Take the Super Review quizzes to see how much you've learned - and where you need more study. Makes an excellent study aid and textbook companion. Great for self-study! DETAILS - From cover to cover, each in-depth topic review is easy-to-follow and easy-to-grasp - Perfect when preparing for homework, quizzes, and exams! - Review questions after each topic that highlight and reinforce key areas and concepts - Student-friendly language for easy reading and comprehension - Includes quizzes that test your understanding of the subject

Experiencing Algebra combines beginning and intermediate algebra concepts and actively involves readers in a "total algebra experience." Thomasson and Pesut integrate the use of technology (assuming no prior graphing calculator skills on the part of readers); allow readers to experience algebra through discovery and visualization; illustrate multiple approaches (numerical, graphical, algebraic, and verbal) to problem solving. Rational Numbers; Real Numbers; Variables, Expressions, Equations, and Formulas; Relations, Functions, and Graphs; Linear Equations in One Variable; Linear Equations and Functions in Two Variables; Systems of Linear Equations in Two Variables; Inequalities; Polynomial Functions; Working with Polynomial Expressions; Polynomial Equations and Inequalities in One Variable; Rational Expressions, Functions, and Equations; Radical Expressions, Expressions Containing Rational Exponents, Functions, and Equations; Complex Numbers; Exponential and Logarithmic Functions and Equations. Marek Kuczma was born in 1935 in Katowice, Poland, and died there in 1991. After finishing high school in his home town, he studied at the Jagiellonian University in Kraków. He defended his doctoral dissertation under the supervision of Stanislaw Golab. In the year of his habilitation, in 1963, he obtained a position at the Katowice branch of the Jagiellonian University (now University of Silesia, Katowice), and worked there till his death. Besides his several administrative positions and his outstanding teaching activity, he accomplished excellent and rich scientific work publishing three monographs and 180 scientific papers. He is considered to be the founder of the celebrated Polish school of functional equations and inequalities. "The second half of the title of this book describes its contents adequately. Probably even the most devoted specialist would not have thought that about 300 pages can be written just about the Cauchy equation (and on some closely related equations and inequalities). And the book is by no means chatty, and does not even claim completeness. Part I lists the required preliminary knowledge in set and measure theory, topology and algebra. Part II gives details on solutions of the Cauchy equation and of the Jensen inequality [...], in particular on continuous convex functions, Hamel bases, on inequalities following from the Jensen inequality [...]. Part III deals with related equations and inequalities (in particular, Pexider, Hosszú, and conditional equations, derivations, convex functions of higher order, subadditive functions and stability theorems). It concludes with an excursion into the field of extensions of homomorphisms in general." (Janos Aczel, Mathematical Reviews) "This book is a real holiday for all the mathematicians independently of their strict speciality. One can imagine what deliciousness represents this book for functional equationists." (B. Crstici, Zentralblatt für Mathematik) Functional Equations, Inequalities and Applications provides an extensive study of several important equations and inequalities, useful in a number of problems in mathematical analysis. Subjects dealt with include the generalized Cauchy functional equation, the Ulam stability theory in the geometry of partial differential equations, stability of a quadratic functional equation in Banach modules, functional equations and mean value theorems, isometric mappings, functional inequalities of iterative type, related to a Cauchy functional equation, the median principle for inequalities and applications, Hadamard and Dragomir-Agarwal inequalities, the Euler formulae and convex functions and approximate algebra homomorphisms. Also included are applications to some problems of pure and applied mathematics. This book will be of particular interest to mathematicians and graduate students whose work involves functional equations, inequalities and applications. This book presents the traditional content of Precalculus in a manner that answers the age-old question of "When will I ever use this?" Highlighting truly relevant applications, this book presents the material in an easy to teach from/easy to learn from approach. KEY TOPICS Chapter topics include equations, inequalities, and mathematical models; functions and graphs; polynomial and rational functions; exponential and logarithmic functions; systems of equations and inequalities; matrices and determinants; conic sections; and sequences, induction, and probability. For engineers of every kind, manufacturing personnel, technologists, technicians, and technical marketing professionals. Introductory Mathematical Analysis includes topics from differential and integral calculus that are of interest to students of business, economics, finance and the social sciences. It begins with noncalculus topics such as

equations, inequalities, functions, and mathematics of finance. This book contains the theoretical development of the real number system, the continuity, the differentiability, the integration of functions, and the convergence of sequences and series of real numbers. It also includes the development of sequences and series of functions and an analysis of the properties a limit function may inherit from its approximants. It is designed for students who have an intuitive understanding of and basic competency in the standard procedures of the calculus. Some proofs are sufficiently described but are not overdone. Our guiding philosophy led us to build on this foundation in such a way that pupils achieve the elementary results and acquire fundamental skills in higher business and higher calculus. Partially fulfills Core Mathematics requirement.

Functional Equations and Inequalities with Applications presents a comprehensive, nearly encyclopedic, study of the classical topic of functional equations. This self-contained monograph explores all aspects of functional equations and their applications to related topics, such as differential equations, integral equations, the Laplace transformation, the calculus of finite differences, and many other basic tools in analysis. Each chapter examines a particular family of equations and gives an in-depth study of its applications as well as examples and exercises to support the material. "Introductory Algebra" is a low cost alternative to an expensive traditional Algebra I book. Crafted by a high school Algebra I and II teacher based on experience of those courses. The text starts with a review and discussion of number sense and fluency and then dives into the wonderful ocean that is algebra. Starting with linear expressions, equations, inequalities, and graphs, this text goes through examples in a formulaic, straightforward manner. Ending with quadratic equations, factoring, and graphing, it encompasses everything one could want from an introduction to algebra. This first edition is our student edition and it lacks an answer key and solution key. Algebra, traditionally, deals with equations, systems of equations, inequalities, polynomials, etc, and develops methods and techniques which serve as an introduction to higher Mathematics. This book was written to provide an essential help to all university students, in the areas of Mathematics, Physics and Engineering. A knowledge of introductory College Algebra is desirable, and can be found in my book, "College Algebra, Vol. 1". This first volume, is devoted to set theory, set of real numbers, algebraic operations, ratios and proportions, inequalities, absolute values, identities, factorization and permanent inequalities. The current volume, "College Algebra, Vol. 2" is, by far, more advanced, and covers several topics on higher degree equations and inequalities, systems of equations (linear and non linear), polynomials, complex numbers, progressions, logarithmic and exponential equations, etc. The book contains 19 chapters, as shown analytically in the table of contents. Chapter 1 is devoted to mappings and functions, Cartesian coordinates and graphs of functions. Chapter 2 treats first degree equations in one unknown, factored equations and equations involving absolute values. Chapter 3 covers first degree inequalities in one unknown and inequalities with absolute values. Chapter 4 concentrates on systems of linear equations, ($2 \times 2, 3 \times 3$, etc). Useful and powerful methods and techniques are developed, (method of substitution, Cramer's rule, Gauss's elimination method, the generalized method of substitution, etc), for the solution of linear systems and various special types of linear systems are considered. Graphical solution of linear systems and linear inequalities are studied in chapter 5, while rational equations and rational inequalities are considered in chapter 6. Irrational equations are studied in chapter 7. The theory of complex numbers and related properties are developed in chapter 8. Quadratic equations are studied in considerable depth and details in chapter 9, while the theory of quadratic trinomial is developed in chapter 10. Chapter 11 is devoted to equations and inequalities transformable to quadratic equations and inequalities, (for example, biquadratic equations, reciprocal equations, binomial and trinomial equations, etc). Non linear algebraic systems are considered in chapter 12. Polynomials in one variable and related theorems are studied in chapter 13, while chapter 14 is devoted to the general properties of polynomial equations, (theorem of conjugate roots, theorem of rational roots, theorem of irrational roots, Vieta's theorem, etc). Polynomials in several variables and related theorems are studied in chapter 15. Arithmetic, harmonic and geometric progressions and various applications are introduced in chapter 16.

Logarithms, logarithmic equations and exponential equations are developed in chapter 17. Chapter 18 is devoted to the theory of conditional maxima and minima of functions of several variables. Finally, in chapter 19, we study some special topics, related to the application of complex numbers in polynomials and trigonometry. The famous, Cote's theorem, is proved easily, with the aid of complex numbers. At the end of the book, there is a list of 256 supplementary problems, covering all topics developed in the book. The book contains, in total, 310 solved examples and 1050 problems for solution. The examples and the problems have been selected to help students develop a solid background in Algebra, broaden their knowledge and sharpen their analytical skills, and finally, prepare them to pursue successfully more advanced studies in Mathematics and Engineering. Hints or detailed instructions are given for the more involved problems, while answers to odd-numbered problems are provided, so that the students can check their progress and understating of the material studied. This clear, accessible treatment of mathematics features a building-block approach toward problem solving, realistic and diverse applications, and chapter organizer to help users focus their study and become effective and confident problem solvers. The "Putting Your Skills to Work" and new chapter-end feature, "Math in the Media," present readers with opportunities to utilize critical thinking skills, analyze and interpret data, and problem solve using applied situations encountered in daily life.

Real Numbers and Variables; Equations, Inequalities and Applications; Graphs and Functions; Systems of Linear Equations and Inequalities; Exponents and Polynomials; Factoring; Rational Expressions and Equations; Rational Exponents and Radicals; Quadratic Equations, Inequalities, and Absolute Value; The Conic Sections; Additional Properties of Functions; Logarithmic and Exponential Functions. This book outlines the modern theory of functional equations and inequalities in several variables. It consists of three parts. The first is devoted to additive and convex functions defined on linear spaces with semilinear topologies. In the second part, the problems of stability of functional equations in the sense of Ulam-Hyers-Rassias and in some function spaces are considered. In the last part, the functional equations in set-valued functions are dealt with for the first time in the mathematical literature. The book contains many fresh results concerning those problems.

REA's Essentials provide quick and easy access to critical information in a variety of different fields, ranging from the most basic to the most advanced. As its name implies, these concise, comprehensive study guides summarize the essentials of the field covered. Essentials are helpful when preparing for exams, doing homework and will remain a lasting reference source for students, teachers, and professionals.

Algebra & Trigonometry I includes sets and set operations, number systems and fundamental algebraic laws and operations, exponents and radicals, polynomials and rational expressions, equations, linear equations and systems of linear equations, inequalities, relations and functions, quadratic equations, equations of higher order, as well as ratio, proportion, and variation. "A treatise on finite difference ineuqualities that have important applications to theories of various classes of finite difference and sum-difference equations, including several linear and nonlinear finite difference inequalities appearing for the first time in book form." For Beginning, Intermediate, and College Algebra courses. This 6-Page foldout card covers Brief Basic Math review, Linear Equations, Exponents, Polynomials, Factoring, Rational Expressions, Systems of Equations, Inequalities, Functions, Roots and Radicals, Conic Sections, and Much more

CK-12's Basic Algebra is a clear introduction to the algebraic topics of functions, equations, and graphs for middle-school and high-school students. Volume 1 includes the first 6 chapters: Expressions, Equations, and Functions, Properties of Real Numbers, Linear Equations, Graphing Linear Equations and Functions, Writing Linear Equations, and Linear Inequalities and Absolute Value; An Introduction to Probability. Facilitate a smooth transition from algebra to algebra II for students in grades 7 and up using Helping Students Understand Algebra II. This 128-page book includes step-by-step instructions with examples, practice problems using the concepts, real-life applications, a list of symbols and terms, tips, and answer keys. The book supports NCTM standards and includes chapters on topics such as solving equations, inequalities, polynomials, rational expressions, roots and radicals, and quadratic expressions. This book is a collection of original research

and survey articles on mathematical inequalities and their numerous applications in diverse areas of mathematics and engineering. It includes chapters on convexity and related concepts; inequalities for mean values, sums, functions, operators, functionals, integrals and their applications in various branches of mathematics and related sciences; fractional integral inequalities; and weighted type integral inequalities. It also presents their wide applications in biomathematics, boundary value problems, mechanics, queuing models, scattering, and geomechanics in a concise, but easily understandable way that makes the further ramifications and future directions clear. The broad scope and high quality of the contributions make this book highly attractive for graduates, postgraduates and researchers. All the contributing authors are leading international academics, scientists, researchers and scholars. As Richard Bellman has so elegantly stated at the Second International Conference on General Inequalities (Oberwolfach, 1978), "There are three reasons for the study of inequalities: practical, theoretical, and aesthetic." On the aesthetic aspects, he said, "As has been pointed out, beauty is in the eye of the beholder. However, it is generally agreed that certain pieces of music, art, or mathematics are beautiful. There is an elegance to inequalities that makes them very attractive." The content of the Handbook focuses mainly on both old and recent developments on approximate homomorphisms, on a relation between the Hardy–Hilbert and the Gabriel inequality, generalized Hardy–Hilbert type inequalities on multiple weighted Orlicz spaces, half-discrete Hilbert-type inequalities, on affine mappings, on contractive operators, on multiplicative Ostrowski and trapezoid inequalities, Ostrowski type inequalities for the Riemann–Stieltjes integral, means and related functional inequalities, Weighted Gini means, controlled additive relations, Szasz–Mirakyan operators, extremal problems in polynomials and entire functions, applications of functional equations to Dirichlet problem for doubly connected domains, nonlinear elliptic problems depending on parameters, on strongly convex functions, as well as applications to some new algorithms for solving general equilibrium problems, inequalities for the Fisher's information measures, financial networks, mathematical models of mechanical fields in media with inclusions and holes. This volume provides an extensive study of some of the most important topics of current interest in functional equations and inequalities. Subjects dealt with include: a Pythagorean functional equation, a functional definition of trigonometric functions, the functional equation of the square root spiral, a conditional Cauchy functional equation, an iterative functional equation, the Hille-type functional equation, the polynomial-like iterative functional equation, distribution of zeros and inequalities for zeros of algebraic polynomials, a qualitative study of Lobachevsky's complex functional equation, functional inequalities in special classes of functions, replicativity and function spaces, normal distributions, some difference equations, finite sums, decompositions of functions, harmonic functions, set-valued quasiconvex functions, the problems of expressibility in some extensions of free groups, Aleksandrov problem and mappings which preserve distances, Ulam's problem, stability of some functional equation for generalized trigonometric functions, Hyers-Ulam stability of Hosszú's equation, superstability of a functional equation, and some demand functions in a duopoly market with advertising. Audience: This book will be of interest to mathematicians and graduate students whose work involves real functions, functions of a complex variable, functional analysis, integral transforms, and operational calculus. Lial/Hornsby/McGinnis's *Introductory and Intermediate Algebra*, 3e gives students the necessary tools to succeed in developmental math courses and prepares them for future math courses and the rest of their lives. The Lial developmental team creates a pattern for success by emphasizing problem solving skills, vocabulary comprehension, real-world applications, and strong exercise sets. In keeping with its proven track record, this revision includes an effective new design, many new exercises and applications, and increased Summary Exercises to enhance comprehension and challenge students' knowledge of the subject matter. *Prealgebra Review; The Real Number System; Linear Equations, Inequalities, and Applications; Graphs of Linear Equations and Inequalities; Functions; Systems of Equations and Inequalities; Exponents and Polynomials; Factoring and Applications; Rational Expressions and Functions; Equations, Inequalities, and Systems Revisited; Roots, Radicals, and Root Functions; Quadratic*

Equations, Inequalities, and Functions; Exponential and Logarithmic Functions; Nonlinear Functions, Conic Sections, and Nonlinear Systems For all readers interested in introductory and intermediate algebra. Key Message: The Lial series has helped thousands of readers succeed in developmental mathematics through its approachable writing style, relevant real-world examples, extensive exercise sets, and complete supplements package. Key Topics: Review of the Real Number System; Linear Equations, Inequalities, and Applications; Graphs, Linear Equations, and Functions; Systems of Linear Equations; Exponents, Polynomials, and Polynomial Functions; Factoring; Rational Expressions and Functions; Roots, Radicals, and Root Functions; Quadratic Equations, Inequalities, and Functions; Inverse, Exponential, and Logarithmic Functions; Nonlinear Functions, Conic Sections, and Nonlinear Systems; Sequences and Series Market: For all readers interested in Intermediate Algebra. This book is devoted to recent developments of linear and nonlinear integral inequalities on time scales. The book is intended for the use in the field of dynamic calculus on time scales, dynamic equation and integral equations on time scales. It is also suitable for graduate courses in the above fields. The book is designed for those who have mathematical background on time scales calculus. Supplemental math textbook for high school students, with innovative features: - shortcuts in solving linear equations and inequalities - innovative techniques in solving by number line - innovative approaches in solving by graphing, using graphing calculators Make algebra equations easy for students in grades 7 and up using Algebra II Practice! This 128-page book is geared toward students who struggle in algebra II and covers the concepts of inequalities, linear equations, polynomial products and factors, rational expressions, roots, radicals, complex numbers, quadratic equations and functions, and variations. The book supports NCTM standards and includes clear instructions, examples, practice problems, definitions, problem-solving strategies, an assessment section, answer keys, and references. This volume presents cutting edge research from the frontiers of functional equations and analytic inequalities active fields. It covers the subject of functional equations in a broad sense, including but not limited to the following topics: Hyperstability of a linear functional equation on restricted domains Hyers–Ulam’s stability results to a three point boundary value problem of nonlinear fractional order differential equations Topological degree theory and Ulam’s stability analysis of a boundary value problem of fractional differential equations General Solution and Hyers-Ulam Stability of Duo Trigintic Functional Equation in Multi-Banach Spaces Stabilities of Functional Equations via Fixed Point Technique Measure zero stability problem for the Drygas functional equation with complex involution Fourier Transforms and Ulam Stabilities of Linear Differential Equations Hyers–Ulam stability of a discrete diamond–alpha derivative equation Approximate solutions of an interesting new mixed type additive-quadratic-quartic functional equation. The diverse selection of inequalities covered includes Opial, Hilbert-Pachpatte, Ostrowski, comparison of means, Poincare, Sobolev, Landau, Polya-Ostrowski, Hardy, Hermite-Hadamard, Levinson, and complex Korovkin type. The inequalities are also in the environments of Fractional Calculus and Conformable Fractional Calculus. Applications from this book's results can be found in many areas of pure and applied mathematics, especially in ordinary and partial differential equations and fractional differential equations. As such, this volume is suitable for researchers, graduate students and related seminars, and all science and engineering libraries. The exhibited thirty six chapters are self-contained and can be read independently and interesting advanced seminars can be given out of this book. This is the first English translation of Thomas Harriot’s seminal *Artis Analyticae Praxis*, first published in Latin in 1631. It has recently become clear that Harriot's editor substantially rearranged the work, and omitted sections beyond his comprehension. Commentary included with this translation relates to corresponding pages in the manuscript papers, enabling exploration of Harriot's novel and advanced mathematics. This publication provides the basis for a reassessment of the development of algebra. This book focuses on one- and multi-dimensional linear integral and discrete Gronwall-Bellman type inequalities. It provides a useful collection and systematic presentation of known and new results, as well as many applications to differential (ODE and PDE), difference, and integral equations.

With this work the author fills a gap in the literature on inequalities, offering an ideal source for researchers in these topics. The present volume is part 1 of the author's two-volume work on inequalities. Integral and discrete inequalities are a very important tool in classical analysis and play a crucial role in establishing the well-posedness of the related equations, i.e., differential, difference and integral equations. This volume constitutes the first part of a monograph on theory and applications of differential and integral inequalities. The entire work, as a whole, is intended to be a research monograph, a guide to the literature, and a textbook for advanced courses. The unifying theme of this treatment is a systematic development of the theory and applications of differential inequalities as well as Volterra integral inequalities. The main tools for applications are the norm and the Lyapunov functions. Familiarity with real and complex analysis, elements of general topology and functional analysis, and differential and integral equations is assumed. Since from more than a century, the study of various types of integral equations and inequalities has been focus of great attention by many researchers, interested both in theory and its applications. In particular, there exists a very rich literature related to the integral equations and inequalities and their applications. The present monograph is an attempt to organize recent progress related to the Multidimensional integral equations and inequalities, which we hope will widen the scope of their new applications. The field to be covered is extremely wide and it is nearly impossible to treat all of them here. The material included in the monograph is recent and hard to find in other books. It is accessible to any reader with reasonable background in real analysis and acquaintance with its related areas. All results are presented in an elementary way and the book could also serve as a textbook for an advanced graduate course. The book deserves a warm welcome to those who wish to learn the subject and it will also be most valuable as a source of reference in the field. It will be an invaluable reading for mathematicians, physicists and engineers and also for graduate students, scientists and scholars wishing to keep abreast of this important area of research. In college or college bound, the importance of the Algebra struggle is real. Whether math is second nature or a challenge this guide is your go-to for answers at your fingertips. This 6 page comprehensive guide offers clear and concise examples, explanations, and the graphs that go with them for review, study, or to quickly look up that concept that eludes you. For some students algebra is just the beginning of their college math career, others just need to make the grade. QuickStudy guides have proven their support of students and better grades at all levels for more than 25 years. Boost confidence for tests and grades for future success. 6 page laminated guide includes: Sets of Numbers Equations & Inequalities Linear Equations Absolute Value Equations Quadratic Equations Solving Systems of Equations Functions Domain & Range Operations with Functions Inverses Polynomials Radicals Rational Functions Direct, Joint & Inverse Variation Solving Rational Equations & Inequalities Exponential Functions Logarithmic Functions This book concentrates on one- and multi-dimensional nonlinear integral and discrete Gronwall-Bellman type inequalities. It complements the author's book on linear inequalities and serves as an essential tool for researchers interested in differential (ODE and PDE), difference, and integral equations. The present volume is part 2 of the author's two-volume work on inequalities. Integral and discrete inequalities are a very important tool in classical analysis and play a crucial role in establishing the well-posedness of the related equations, i.e., differential, difference and integral equations. College Algebra provides a comprehensive exploration of algebraic principles and meets scope and sequence requirements for a typical introductory algebra course. The modular approach and richness of content ensure that the book meets the needs of a variety of courses. College Algebra offers a wealth of examples with detailed, conceptual explanations, building a strong foundation in the material before asking students to apply what they've learned. Coverage and Scope In determining the concepts, skills, and topics to cover, we engaged dozens of highly experienced instructors with a range of student audiences. The resulting scope and sequence proceeds logically while allowing for a significant amount of flexibility in instruction. Chapters 1 and 2 provide both a review and foundation for study of Functions that begins in Chapter 3. The authors recognize that while some institutions may find this material a prerequisite, other institutions have told

us that they have a cohort that need the prerequisite skills built into the course. Chapter 1: Prerequisites Chapter 2: Equations and Inequalities Chapters 3-6: The Algebraic Functions Chapter 3: Functions Chapter 4: Linear Functions Chapter 5: Polynomial and Rational Functions Chapter 6: Exponential and Logarithm Functions Chapters 7-9: Further Study in College Algebra Chapter 7: Systems of Equations and Inequalities Chapter 8: Analytic Geometry Chapter 9: Sequences, Probability and Counting Theory

In a remarkably short time, the field of inequality problems has seen considerable development in mathematics and theoretical mechanics. Applied mechanics and the engineering sciences have also benefitted from these developments in that open problems have been treated and entirely new classes of problems have been formulated and solved. This book is an outgrowth of seven years of seminars and courses on inequality problems in mechanics for a variety of audiences in the Technical University of Aachen, the Aristotle University of Thessaloniki, the University of Hamburg and the Technical University of Milan. The book is intended for a variety of readers, mathematicians and engineers alike, as is detailed in the Guidelines for the Reader. It goes without saying that the work of G. Fichera, J. L. Lions, G. Maier, J. J. Moreau in originating and developing the theory of inequality problems has considerably influenced the present book. I also wish to acknowledge the helpful comments received from C. Bisbos, J. Haslinger, B. Kawohl, H. Matthies, H. O. May, D. Talaslidis and B. Werner. Credit is also due to G. Kyriakopoulos and T. Mandopoulou for their exceptionally diligent work in the preparation of the final figures. Many thanks are also due to T. Finnegan and J. Gateley for their friendly assistance from the linguistic standpoint. I would also like to thank my editors in Birkhäuser Verlag for their cooperation, and all those who helped in the preparation of the manuscript. One service mathematics has rendered the *~l moil ...*, *Li j'avait su comment en revenir, je n'y serais point aUe.*' human race. It has put common sense back Jules Verne where it belongs, on the topmost shelf next to the dusty canister labelled 'discarded non- The series is divergent; therefore we may be sense'. Eric T. Bell able to do something with it. O. Heaviside Mathematics is a tool for thought. A highly necessary tool in a world where both feedback and non linearities abound. Similarly, all kinds of parts of mathematics serve as tools for other parts and for other sciences. Applying a simple rewriting rule to the quote on the right above one finds such statements as: 'One service topology has rendered mathematical physics .. .'; 'One service logic has rendered computer science .. .'; 'One service category theory has rendered mathematics .. .'. All arguably true. And all statements obtainable this way form part of the *raison d'être* of this series.

Functional Equations and Inequalities provides an extensive study of some of the most important topics of current interest in functional equations and inequalities. Subjects dealt with include: a Pythagorean functional equation, a functional definition of trigonometric functions, the functional equation of the square root spiral, a conditional Cauchy functional equation, an iterative functional equation, the Hille-type functional equation, the polynomial-like iterative functional equation, distribution of zeros and inequalities for zeros of algebraic polynomials, a qualitative study of Lobachevsky's complex functional equation, functional inequalities in special classes of functions, replicativity and function spaces, normal distributions, some difference equations, finite sums decompositions of functions, harmonic functions, set-valued quasiconvex functions, the problem of expressibility in some extensions of free groups, Aleksandrov problem and mappings which preserve distances, Ulam's problem, stability of some functional equation for generalized trigonometric functions, Hyers-Ulam stability of Hosszil's equation, superstability of a functional equation, and some demand functions in a duopoly market with advertising. It is a pleasure to express my deepest appreciation to all the mathematicians who contributed to this volume. Finally, we wish to acknowledge the superb assistance provided by the staff of Kluwer Academic Publishers.

June 2000 Themistocles M. Rassias xi

ON THE STABILITY OF A FUNCTIONAL EQUATION FOR GENERALIZED TRIGONOMETRIC FUNCTIONS ROMAN BADORA Instytut Matematyki, Uniwersytet Śląski, ul. Bankowa 14, PL-40-007 Katowice, Poland, e-mail: robadora@gate.math.us.edu.pl

Abstract. In the present paper the stability result concerning a functional equation for generalized trigonometric functions is presented. Z.

