Solution To A Polynomial Equation

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Paa Kong Christian den Syvendes høitidelige Fødsels-Fest som den 29. Jan. 1801 paa det Kgl. Gymnasium i Odense med Oration og Musique helligholdtes, bleve følgende Sange opførte af Skolens Cantor Johan Jacob Heimeran World Scientific
With the advent of computers, theoretical studies and solution methods for polynomial equations have changed dramatically. Many classical results can be more usefully recast within a different framework which in turn lends itself to further theoretical development tuned to computation. This first book in a trilogy is devoted to the new approach. It is a handbook covering the classical theory of finding roots of a univariate polynomial, emphasizing computational aspects, especially the representation and manipulation of algebraic numbers, enlarged by more recent representations like the Duval Model and the Thom Codification. Mora aims to show that solving a polynomial equation really means finding algorithms that help one manipulate roots rather than simply computing them; to that end he also surveys algorithms for factorizing univariate polynomials.

Intermediate Algebra 2e CRC Press
Bridging a number of mathematical disciplines, and exposing many facets of systems of polynomial equations, Bernd Sturmfels's study covers a wide spectrum of mathematical techniques and algorithms, both symbolic and numerical.

College Algebra American Mathematical Soc.
Solution of Equations and Systems of Equations, Second Edition deals with the Laguerre iteration, interpolating polynomials, method of steepest descent, and the theory of divided differences. The book reviews the formula for confluent divided differences, Newton's interpolation formula, general interpolation problems, and the triangular schemes for computing divided differences. The text explains the method of False Position (Regula Falsi) and cites examples of computation using the Regula Falsi. The book discusses iterations by monotonic iterating functions and analyzes the connection of the Regula Falsi with the theory of iteration. The text also explains the idea of the Newton-Raphson method and compares it with the Regula Falsi. The book also cites asymptotic behavior of errors in the Regula Falsi iteration, as well as the theorem on the error of the Taylor approximation to the root. The method of steepest descent or gradient method proposed by Cauchy ensures "global convergence" in very general conditions. This book is suitable for mathematicians, students, and professor of calculus, and advanced mathematics.

Second-Order Sturm-Liouville Difference Equations and Orthogonal Polynomials Simon and Schuster
Polynomials are well known for their ability to improve their properties and for their applicability in the interdisciplinary fields of engineering and science. Many problems arising in engineering and physics are mathematically constructed by differential equations. Most of these problems can only be solved using special polynomials. Special polynomials and orthonormal polynomials provide a new way to analyze solutions of various equations often encountered in engineering and physical problems. In particular, special polynomials play a fundamental and important role in mathematics and applied mathematics. Until now, research on polynomials has been done in mathematics and applied mathematics only. This book is based on recent results in all areas related to polynomials. Divided into sections on theory and application, this book provides an overview of the current research in the field of polynomials. Topics include cyclotomic and Littlewood polynomials; Descartes' rule of signs; obtaining explicit formulas and identities for polynomials defined by generating functions; polynomials with symmetric zeros; numerical investigation on the structure of the zeros of the q-tangent polynomials; investigation and synthesis of robust polynomials in uncertainty on the basis of the root locus theory; pricing basket options by polynomial approximations; and orthogonal expansion in time domain method for solving Maxwell's equations using paralleling-in-order scheme.

Algorithms in Real Algebraic Geometry Birkhäuser

Transcendental equations arise in every branch of science and engineering. While most of these equations are easy to solve, some are not, and that is where this book serves as the mathematical equivalent of a skydiver's reserve parachute--not always needed, but indispensible when it is. The author's goal is to teach the art of finding the root of a single algebraic equation or a pair of such equations.

Computational Methods for Abstract Polynomial Equations New York : Springer-Verlag

Working out solutions to polynomial equations is a mathematical problem that dates from antiquity. Galois developed a theory in which the obstacle to solving a polynomial equation is an associated collection of symmetries. Obtaining a root requires "breaking" that symmetry. When the degree of an equation is at least five, Galois Theory established that there is no formula for the solutions like those found in lower degree cases. However, this negative result doesn't mean that the practice of equation-solving ends. In a recent breakthrough, Doyle and McMullen devised a solution to the fifth-degree equation that uses geometry, algebra, and dynamics to exploit icosahedral symmetry. Polynomials, Dynamics, and Choice: The Price We Pay for Symmetry is organized in two parts, the first of which develops an account of polynomial symmetry that relies on considerations of algebra and geometry. The second explores beyond polynomials to spaces consisting of choices ranging from mundane decisions to evolutionary algorithms that search for optimal outcomes. The two algorithms in Part I provide frameworks that capture structural issues that can arise in deliberative settings. While decision-making has been approached in mathematical terms, the novelty here is in the use of equation-solving algorithms to illuminate such problems. Features Treats the topic—familiar to many—of solving polynomial equations in a way that’s dramatically different from what they saw in school Accessible to a general audience with limited mathematical background Abundant diagrams and graphics.

Precalculus Cambridge University Press

This is an open textbook covering a two-quarter pre-calculus sequence including trigonometry. The first portion of the book is an investigation of functions, exploring the graphical behavior of, interpretation of, and solutions to problems involving linear, polynomial, rational, exponential, and logarithmic functions. The second portion of the book introduces trigonometry, introduced through an integrated circle/triangle approach. Identities are introduced in the first chapter, and revisited throughout. Likewise, solving is introduced in the second chapter and revisited more extensively in the third chapter. An emphasis is placed on modeling and interpretation, as well as the important characteristics needed in calculus.

Polynomials SIAM

This book is the definitive work on polynomial solution theory. Starting with the simplest linear equations with complex coefficients, this book proceeds in a step by step logical manner to outline the method for solving equations of arbitrarily high degree. Polynomial Resolution Theory is an invaluable book because of its unique perspective on the age old problem of solving polynomial equations of arbitrarily high degree. First of all Hardy insists upon pursuing the subject by using general complex coefficients rather than restricting himself to real coefficients. Complex numbers are used in ordered pair (x,y) form rather than the more traditional x + iy (or x + jy) notation. As Hardy comments, "The Fundamental Theorem of Algebra makes the treatments of polynomials with complex coefficients mandatory. We must not allow applications to direct the way mathematics is presented, but must permit the mathematical results themselves determine how to present the subject. Although practical, real-world applications are important, they must not be allowed to dictate the way in which a subject is treated. Thus, although there are at present no practical applications which employ polynomials with complex coefficients, we must present this subject with complex rather than restrictive real coefficients." This book then proceeds to recast familiar results in a more consistent notation for later progress. Two methods of solution to the general cubic equation with complex coefficients are presented. Then Ferrari's solution to the general complex bicubic (fourth degree) polynomial equation is presented. After this Hardy seamlessly presents the first extension of Ferrari's work to resolving the general bicubic (sixth degree) equation with complex coefficients into two component cubic equations. Eight special cases of this equation which are solvable in closed form are developed with detailed examples. Next the resolution of the octal (eighth degree) polynomial equation is developed along with twelve special cases which are solvable in closed form. This book is appropriate for students at the advanced college algebra level who have an understanding of the basic arithmetic of the complex numbers and know how to use a calculator which handles complex numbers directly. Hardy continues to develop the theory of polynomial resolution to equations of degree forty-eight. An extensive set of appendices is useful for verifying derived results and for rigging various special case equations. This is the 3rd edition of Hardy's book.

Solving Polynomial Equations Elsevier

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

The Numerical Solution of Systems of Polynomials Arising in Engineering and Science Elsevier

This well-written book is a timely and significant contribution to the understanding of difference equations. Presenting machinery for analyzing many discrete physical situations, the book will be of interest to physicists and engineers as well as mathematicians. The book develops a theory for regular and singular Sturm-Liouville boundary value problems for difference equations, generalizing many of the known results for differential equations. Discussing the self-adjointness of these problems as well as their abstract spectral resolution in the appropriate L^2 setting, the book gives necessary and sufficient conditions for a second-order difference operator to be self-adjoint and have orthogonal polynomials as eigenfunctions. These polynomials are classified into four categories, each of which is given a properties survey and a representative example. Finally, the book shows that the various difference operators defined for these problems are still self-adjoint when restricted to ``energy norms". This book is suitable as a text for an advanced graduate course on Sturm-Liouville operators or on applied analysis.

Computations in Algebraic Geometry with Macaulay 2 Springer Science & Business Media

This book is devoted to the analysis of approximate solution techniques for differential equations, based on classical orthogonal polynomials. These techniques are popularly known as spectral methods. In the last few decades, there has been a growing interest in this subject. As a

matter offact, spectral methods provide a competitive alternative to other standard approximation techniques, for a large variety of problems. Initial ap plications were concerned with the investigation of periodic solutions of boundary value problems using trigonometric polynomials. Subsequently, the analysis was extended to algebraic polynomials. Expansions in orthogonal basis functions were preferred, due to their high accuracy and flexibility in computations. The aim of this book is to present a preliminary mathematical background for be ginners who wish to study and perform numerical experiments, or who wish to improve their skill in order to tackle more specific applications. In addition, it furnishes a com prehensive collection of basic formulas and theorems that are useful for implementations at any level of complexity. We tried to maintain an elementary exposition so that no experience in functional analysis is required.

Polynomial Root-finding and Polynomiography World Scientific

This book presents algorithmic tools for algebraic geometry, with experimental applications. It also introduces Macaulay 2, a computer algebra system supporting research in algebraic geometry, commutative algebra, and their applications. The algorithmic tools presented here are designed to serve readers wishing to bring such tools to bear on their own problems. The first part of the book covers Macaulay 2 using concrete applications; the second emphasizes details of the mathematics.

Solving Polynomial Systems Using Continuation for Engineering and Scientific Problems Elsevier

1. The generalized moment problem. 1.1. Formulations. 1.2. Duality theory. 1.3. Computational complexity. 1.4. Summary. 1.5. Exercises. 1.6. Notes and sources -- 2. Positive polynomials. 2.1. Sum of squares representations and semi-definite optimization. 2.2. Nonnegative versus s.o.s. polynomials. 2.3. Representation theorems : univariate case. 2.4. Representation theorems : mutivariate case. 2.5. Polynomials positive on a compact basic semi-algebraic set. 2.6. Polynomials nonnegative on real varieties. 2.7. Representations with sparsity properties. 2.8. Representation of convex polynomials. 2.9. Summary. 2.10. Exercises. 2.11. Notes and sources -- 3. Moments. 3.1. The one-dimensional moment problem. 3.2. The multi-dimensional moment problem. 3.3. The K-moment problem. 3.4. Moment conditions for bounded density. 3.5. Summary. 3.6. Exercises. 3.7. Notes and sources -- 4. Algorithms for moment problems. 4.1. The overall approach. 4.2. Semidefinite relaxations. 4.3. Extraction of solutions. 4.4. Linear relaxations. 4.5. Extensions. 4.6. Exploiting sparsity. 4.7. Summary. 4.8. Exercises. 4.9. Notes and sources. 4.10. Proofs -- 5. Global optimization over polynomials. 5.1. The primal and dual perspectives. 5.2. Unconstrained polynomial optimization. 5.3. Constrained polynomial optimization : semidefinite relaxations. 5.4. Linear programming relaxations. 5.5. Global optimality conditions. 5.6. Convex polynomial programs. 5.7. Discrete optimization. 5.8. Global minimization of a rational function. 5.9. Exploiting symmetry. 5.10. Summary. 5.11. Exercises. 5.12. Notes and sources -- 6. Systems of polynomial equations. 6.1. Introduction. 6.2. Finding a real solution to systems of polynomial equations. 6.3. Finding all complex and/or all real solutions : a unified treatment. 6.4. Summary. 6.5. Exercises. 6.6. Notes and sources -- 7. Applications in probability. 7.1. Upper bounds on measures with moment conditions. 7.2. Measuring basic semi-algebraic sets. 7.3. Measures with given marginals. 7.4. Summary. 7.5. Exercises. 7.6. Notes and sources -- 8. Markov chains applications. 8.1. Bounds on invariant measures. 8.2. Evaluation of ergodic criteria. 8.3. Summary. 8.4. Exercises. 8.5. Notes and sources -- 9. Application in mathematical finance. 9.1. Option pricing with moment information. 9.2. Option pricing with a dynamic model. 9.3. Summary. 9.4. Notes and sources -- 10. Application in control. 10.1. Introduction. 10.2. Weak formulation of optimal control problems. 10.3. Semidefinite relaxations for the OCP. 10.4. Summary. 10.5. Notes and sources -- 11. Convex envelope and representation of convex sets. 11.1. The convex envelope of a rational function. 11.2. Semidefinite representation of convex sets. 11.3. Algebraic certificates of convexity. 11.4. Summary. 11.5. Exercises. 11.6. Notes and sources -- 12. Multivariate integration 12.1. Integration of a rational function. 12.2. Integration of exponentials of polynomials. 12.3. Maximum entropy estimation. 12.4. Summary. 12.5. Exercises. 12.6. Notes and sources -- 13. Min-max problems and Nash equilibria. 13.1. Robust polynomial optimization. 13.2. Minimizing the sup of finitely many rational cunctions. 13.3. Application to Nash equilibria. 13.4. Exercises. 13.5. Notes and sources -- 14. Bounds on linear PDE. 14.1. Linear partial differential equations. 14.2. Notes and sources

Solving Polynomial Equations Springer

An exploration of mathematical style through 99 different proofs of the same theorem This book offers a multifaceted perspective on mathematics by demonstrating 99 different proofs of the same theorem. Each chapter solves an otherwise unremarkable equation in distinct historical, formal, and imaginative styles that range from Medieval, Topological, and Doggerel to Chromatic, Electrostatic, and Psychedelic. With a rare blend of humor and scholarly aplomb, Philip Ording weaves these variations into an accessible and wide-ranging narrative on the nature and practice of mathematics. Inspired by the experiments of the Paris-based writing group known as the Oulipo—whose members included Raymond Queneau, Italo Calvino, and Marcel Duchamp—Ording explores new ways to examine the aesthetic possibilities of mathematical activity. 99 Variations on a Proof is a mathematical take on Queneau’s Exercises in Style, a collection of 99 retellings of the same story, and it draws unexpected connections to everything from mysticism and technology to architecture and sign language. Through diagrams, found material, and other imagery, Ording illustrates the flexibility and creative potential of mathematics despite its reputation for precision and rigor. Readers will gain not only a bird’s-eye view of the discipline and its major branches but also new insights into its historical, philosophical, and cultural nuances. Readers, no matter their level of expertise, will discover in these proofs and accompanying commentary surprising new aspects of the mathematical landscape.

The Equation That Couldn't Be Solved SIAM

Good,No Highlights,No Markup,all pages are intact, Slight Shelfwear,may have the corners slightly dented, may have slight color changes/slightly damaged spine.

Numerical Polynomial Algebra Prentice Hall

Primarily a textbook to prepare Sixth Form students for public examinations in Hong Kong, this book is also useful as a reference for undergraduate students since it contains some advanced theory of equations beyond the sixth form level.

Solution of Cubic and Quartic Equations SIAM

In this first-ever graduate textbook on the algorithmic aspects of real algebraic geometry, the main ideas and techniques presented form a coherent and rich body of knowledge, linked to many areas of mathematics and computing. Mathematicians already aware of real algebraic geometry will find relevant information about the algorithmic aspects. Researchers in computer science and engineering will find the required mathematical background. This self-contained book is accessible to graduate and undergraduate students.

Symbolic solution of polynomial equation systems with symmetry Princeton University Press

What do Bach's compositions, Rubik's Cube, the way we choose our mates, and the physics of subatomic particles have in common? All are governed by the laws of symmetry, which elegantly unify scientific and artistic principles. Yet the mathematical language of symmetry-known as group theory-did not emerge from the

study of symmetry at all, but from an equation that couldn't be solved. For thousands of years mathematicians solved progressively more difficult algebraic equations, until they encountered the quintic equation, which resisted solution for three centuries. Working independently, two great prodigies ultimately proved that the quintic cannot be solved by a simple formula. These geniuses, a Norwegian named Niels Henrik Abel and a romantic Frenchman named Évariste Galois, both died tragically young. Their incredible labor, however, produced the origins of group theory. The first extensive, popular account of the mathematics of symmetry and order, The Equation That Couldn't Be Solved is told not through abstract formulas but in a beautifully written and dramatic account of the lives and work of some of the greatest and most intriguing mathematicians in history.

Solving Polynomial Equation Systems I John Wiley & Sons

The book extends the high school curriculum and provides a backdrop for later study in calculus, modern algebra, numerical analysis, and complex variable theory. Exercises introduce many techniques and topics in the theory of equations, such as evolution and factorization of polynomials, solution of equations, interpolation, approximation, and congruences. The theory is not treated formally, but rather illustrated through examples. Over 300 problems drawn from journals, contests, and examinations test understanding, ingenuity, and skill. Each chapter ends with a list of hints; there are answers to many of the exercises and solutions to all of the problems. In addition, 69 "explorations" invite the reader to investigate research problems and related topics.

Handbook of Numerical Methods for the Solution of Algebraic and Transcendental Equations SIAM

The EUROCRYPT ’96 conference was sponsored by the International Asso- ation for Cryptologic Research (IACR)l, in cooperation with the University of Saragossa. It took place at the Palacio de Congresos in Saragossa, Spain, during May 12-16, 1996. This was the fifteenth annual EUROCRYPT conference (this name has been used since the third conference held in 1984), each of which has been held in a different city in Europe. For the second time, proceedings were available at the conference. JosC Pastor Franco, the General Chair, was resp- sible for local organization and registration. His contribution to the snccess of the conference is gratefully acknowledged. The Program Committee considered 126 submitted papers and selected 34 for presentation. Each paper was sent to all members of the Program Committee and was assigned to at least three of them for careful evaluation. There were also two invited talks. James L. Massey, this year’s IACR Distinguished Ltcturer, gave a lecture entitled “The difficulty with difficulty”. Massey is the third to receive this honor, the first two being Gustavus Simmons and Adi Shamir. Shafi Goldwasser gave an invited talk entitled “Multi party secure protocols: past and present”. These proceedings contain revised versions of the 34 contributed talks. While the papers were carefully selected, they have not been refereed like submissions to a refereed journal. The authors bear full responsibility for the contents of their papers. Some authors may write final versions of their papers for publication in a refereed journal.