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KEY=POLYNOMIALS - DIAZ MCKENZIE

INTERPOLATION AND APPROXIMATION BY POLYNOMIALS

Springer Science & Business Media **In addition to coverage of univariate interpolation and approximation, the text includes material on multivariate interpolation and multivariate numerical integration, a generalization of the Bernstein polynomials that has not previously appeared in book form, and a greater coverage of Peano kernel theory than is found in most textbooks. There are many worked examples and each section ends with a number of carefully selected problems that extend the student's understanding of the text. The author is well known for his clarity of writing and his many contributions as a researcher in approximation theory.**

POLYNOMIAL APPROXIMATION AND INTERPOLATION

TOPICS IN POLYNOMIAL AND RATIONAL INTERPOLATION AND APPROXIMATION

POLYNOMIAL APPROXIMATION AND INTERPOLATION

INTERPOLATION AND EXTRAPOLATION OPTIMAL DESIGNS V1

POLYNOMIAL REGRESSION AND APPROXIMATION THEORY

John Wiley & Sons **This book is the first of a series which focuses on the interpolation and extrapolation of optimal designs, an area with significant applications in engineering, physics, chemistry and most experimental fields. In this volume, the authors emphasize the importance of problems associated with the construction of design. After a brief introduction on how the theory of optimal designs meets the theory of the uniform approximation of functions, the authors introduce the basic elements to design planning and link the statistical theory of optimal design and the theory of the uniform approximation of functions. The appendices provide the reader with material to accompany the proofs discussed throughout the book.**

INTERPOLATION PROCESSES

BASIC THEORY AND APPLICATIONS

Springer Science & Business Media **Interpolation of functions is one of the basic part of Approximation Theory. There are many books on approximation theory, including interpolation methods that - peared in the last fty years, but a few of them are devoted only to interpolation processes. An example is the book of J. Szabados and P. Vértesi: Interpolation of Functions, published in 1990 by World Scienti c. Also, two books deal with a special interpolation problem, the so-called Birkhoff interpolation, written by G.G. Lorentz, K. Jetter, S.D. Riemenschneider (1983) and Y.G. Shi (2003). The classical books on interpolation address numerous negative results, i.e., -sultsondivergentinterpolationprocesses,usuallyconstructedoversomeequidistant system of nodes. The present book deals mainly with new results on convergent - terpolation processes in uniform norm, for algebraic and trigonometric polynomials, not yet published in other textbooks and monographs on approximation theory and numerical mathematics. Basic tools in this eld (orthogonal polynomials, moduli of smoothness,K-functionals, etc.), as well as some selected applications in numerical integration, integral equations, moment-preserving approximation and summation of slowly convergent series are also given. The rstchapterprovidesanaccountofbasicfactsonapproximationbyalgebraic and trigonometric polynomials introducing the most important concepts on appro- mation of functions. Especially, in Sect. 1.4 we give basic results on interpolation by algebraic polynomials, including representations and computation of interpolation polynomials, Lagrange operators, interpolation errors and uniform convergence in some important classes of functions, as well as an account on the Lebesgue function and some estimates for the Lebesgue constant.**

A SIMPLE INTRODUCTION TO NUMERICAL ANALYSIS

VOLUME 2: INTERPOLATION AND APPROXIMATION

CRC Press **Approximation techniques are widely used in mathematics and applied physics, as exact solutions are frequently impossible to obtain. A Simple Introduction to Numerical Analysis, Volume 2: Interpolation and Approximation extends the first volume to consider problems in interpolation and approximation. Topics covered include the construction of interpolating functions, the determination of polynomial and rational function approximations, numerical quadrature, and the solution of boundary value problems in ordinary differential equations. As with the previous volume, the text is integrated with a software package that allows the reader to work through numerous examples. It is also possible to use the software to consider problems that are beyond the scope of the text. The authors' expertise in combining text and software has resulted in a very readable work.**

INTERPOLATION AND APPROXIMATION

Courier Corporation **Intermediate-level survey covers remainder theory, convergence theorems, and uniform and best approximation. Other topics include least square approximation, Hilbert space, orthogonal polynomials, theory of closure and completeness, and more. 1963 edition.**

APPROXIMATION THEORY AND APPROXIMATION PRACTICE, EXTENDED EDITION

SIAM **This is a textbook on classical polynomial and rational approximation theory for the twenty-first century. Aimed at advanced undergraduates and graduate students across all of applied mathematics, it uses MATLAB to teach the field□s most important ideas and results. Approximation Theory and Approximation Practice, Extended Edition differs fundamentally from other works on approximation theory in a number of ways: its emphasis is on topics close to numerical algorithms; concepts are illustrated with Chebfun; and each chapter is a PUBLISHable MATLAB M-file, available online. The book centers on theorems and methods for analytic functions, which appear so often in applications, rather than on functions at the edge of discontinuity with their seductive theoretical challenges. Original sources are cited rather than textbooks, and each item in the bibliography is accompanied by an editorial comment. In addition, each chapter has a collection of exercises, which span a wide range from mathematical theory to Chebfun-based numerical experimentation. This textbook is appropriate for advanced undergraduate or graduate students who have an understanding of numerical analysis and complex analysis. It is also appropriate for seasoned mathematicians who use MATLAB.**

FRONTIERS IN INTERPOLATION AND APPROXIMATION

CRC Press **Dedicated to the well-respected research mathematician Ambikeshwar Sharma, Frontiers in Interpolation and Approximation explores approximation theory, interpolation theory, and classical analysis. Written by authoritative international mathematicians, this book presents many important results in classical analysis, wavelets, and interpolation theory. Some topics covered are Markov inequalities for multivariate polynomials, analogues of Chebyshev and Bernstein inequalities for multivariate polynomials, various measures of the smoothness of functions, and the equivalence of Hausdorff continuity and pointwise Hausdorff-Lipschitz continuity of a restricted center multifunction. The book also provides basic facts about interpolation, discussing classes of entire functions such as algebraic polynomials, trigonometric polynomials, and nonperiodic transcendental entire functions. Containing both original research and comprehensive surveys, this book provides researchers and graduate students with important results of interpolation and approximation.**

SHAPE-PRESERVING APPROXIMATION BY REAL AND COMPLEX POLYNOMIALS

Springer Science & Business Media **First comprehensive treatment in book form of shape-preserving approximation by real or complex polynomials in one or several variables Of interest to grad students and researchers in approximation theory, mathematical analysis, numerical analysis, Computer Aided Geometric Design, robotics, data fitting, chemistry, fluid mechanics, and engineering Contains many open problems to spur future research Rich and updated bibliography**

MATHEMATICS OF APPROXIMATION

Springer Science & Business Media **The approximation of a continuous function by either an algebraic polynomial, a trigonometric polynomial, or a spline, is an important issue in application areas like computer-aided geometric design and signal analysis. This book is an introduction to the mathematical analysis of such approximation, and, with the prerequisites of only calculus and linear algebra, the material is targeted at senior undergraduate level, with a treatment that is both rigorous and self-contained. The topics include polynomial interpolation; Bernstein polynomials and the Weierstrass theorem; best approximations in the general setting of normed linear spaces and inner product spaces; best uniform polynomial approximation; orthogonal polynomials; Newton-Cotes , Gauss and Clenshaw-Curtis quadrature; the Euler-Maclaurin formula ; approximation of periodic functions; the uniform convergence of Fourier series; spline approximation,with an extensive treatment of local spline interpolation,and its application in quadrature. Exercises are provided at the end of each chapter**

MULTIVARIATE POLYNOMIAL APPROXIMATION

Birkhäuser **This book introduces general theory by presenting the most important facts on multivariate interpolation, quadrature, orthogonal projections and their summation, all treated under a constructive view, and embedded in the theory of positive linear operators. On this background, the book builds the first comprehensive introduction to the**

theory of generalized hyperinterpolation. Several parts of the book are based on rotation principles, which are presented in the beginning of the book.

BEST TSCHEBYSCHEFF APPROXIMATION BY INTERPOLATION POLYNOMIALS

APPROXIMATION THEORY VIII

IN 2 VOLUMES

World Scientific **' This is the collection of the refereed and edited papers presented at the 8th Texas International Conference on Approximation Theory. It is interdisciplinary in nature and consists of two volumes. The central theme of Vol. I is the core of approximation theory. It includes such important areas as qualitative approximations, interpolation theory, rational approximations, radial-basis functions, and splines. The second volume focuses on topics related to wavelet analysis, including multiresolution and multi-level approximation, subdivision schemes in CAGD, and applications. Contents:Volume I:Differentiated Shift-Invariant Integral Operators (G A Anastassiou)Efficient Matrix Methods for the True Least-Squares Approximation of Structured Multivariate Data (I J Anderson & J C Mason)Vectorially Minimal Projections (A Bacopoulos & B L Chalmers)Error of an Arbitrary Order for the Approximate Solution of Systems of nth Order Differential Equations with Spline Functions (B S Badr et al)A Note on Irving Glicksberg''s Pseudocompactness Papers (J Blatter & H König)A Multivariate Divided Difference (C de Boor)Approximation Using Positive Definite Functions (E W Cheney)A Brief Glance at the Research of Ward Cheney (W Light)Ideas of Weighted Polynomial Approximation on (-∞,∞) (D S Lubinsky)Piecewise Convex Function Estimation and Model Selection (K S Riedel)Multivariate Interpolation and Approximation by Translates of a Basis Function (R Schaback)and other papersVolume II:A Wavelet-Like Unconditional Basis (K-F Chang)Multivariate Interpolating Wavelets (C K Chui & C Li)Nonlinear Wavelet Approximation and Image Compression (A Cohen)Wavelets and Interactive Surface Modeling (E Cornea et al)Multiscale Analysis, Approximation, and the Interpolation Spaces (W Dahmen)Using Fredholm Determinants to Estimate the Smoothness of Refinable Functions (I Daubechies)Stability and Independence of the Shifts of a Multivariate Refinable Function (T Hogan)Refinable Shift-Invariant Spaces: From Splines to Wavelets (R Q Jia)Weakly Singular Fredholm Integral Equations I: Singularity Preserving Wavelet-Galerkin Methods (C A Micchelli & Y-S Xu)and other papers Readership: Applied mathematicians. Keywords:Proceedings;Conference;Approximation Theory;College Station, TX (USA);Interpolation;Wavelets;Multilevel Approximation'**

INTERPOLATION BY HARMONIC POLYNOMIALS

Let Hn (u;z) denote the harmonic polynomial of degree at most n found by interpolation in 2n +1 points in a function u given on the boundary C of a region D of the complex z-plane. Explict formulas are derived for Hn in the case of interpolation on a circle and on an ellipse, and convergence is proved in these cases for arbitrary continuous boundary data. Various generalizations are indicated.

INTERPOLATION AND APPROXIMATION IN THE SPACE OF DIRICHLET POLYNOMIALS

LINEAR ALGEBRA, RATIONAL APPROXIMATION AND ORTHOGONAL POLYNOMIALS

Elsevier **Evolving from an elementary discussion, this book develops the Euclidean algorithm to a very powerful tool to deal with general continued fractions, non-normal Padé tables, look-ahead algorithms for Hankel and Toeplitz matrices, and for Krylov subspace methods. It introduces the basics of fast algorithms for structured problems and shows how they deal with singular situations. Links are made with more applied subjects such as linear system theory and signal processing, and with more advanced topics and recent results such as general bi-orthogonal polynomials, minimal Padé approximation, polynomial root location problems in the complex plane, very general rational interpolation problems, and the lifting scheme for wavelet transform computation. The text serves as a supplement to existing books on structured linear algebra problems, rational approximation and orthogonal polynomials. Features of this book: • provides a unifying approach to linear algebra, rational approximation and orthogonal polynomials • requires an elementary knowledge of calculus and linear algebra yet introduces advanced topics. The book will be of interest to applied mathematicians and engineers and to students and researchers.**

REGULAR POLYNOMIAL INTERPOLATION AND APPROXIMATION OF GLOBAL SOLUTIONS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS

SELECTED TOPICS IN INTERPOLATION AND APPROXIMATION BY POLYNOMIALS, RATIONAL FUNCTIONS, AND MEROMORPHIC FUNCTIONS

APPROXIMATION THEORY AND APPROXIMATION PRACTICE

SIAM **An original and modern treatment of approximation theory for students in applied mathematics. Includes exercises, illustrations and Matlab code.**

POLYNOMIAL INTERPOLATION AND APPROXIMATION OF REAL FUNCTIONS OF ONE AND TWO VARIABLES

MULTIVARIATE APPROXIMATION: FROM CAGD TO WAVELETS

World Scientific **Contents: Fast Algorithms for Simultaneous Polynomial Approximation (G Baszenski & M Tasche)α-Spline**

of Smoothing for Correlated Errors in Dimension Two (M Bozzini & L Lenarduzzi)New Developments in the Theory of Radial Basis Function Interpolation (M D Buhmann)Realization of Neural Networks with One Hidden Layer (C K Chui & X Li)A General Method for Constrained Curves with Boundary Conditions (P Costantini)Sign-Regular and Totally Positive Matrices: An Algorithmic Approach (M Gasca & J M Peña)Some Results on Blossoming and Multivariate B-Splines (R Gormaz & P-J Laurent)Riesz Bounds in Scattered Data Interpolation and L2-Approximation (K Jetter)On Multivariate Hermite Polynomial Interpolation (A Le Méhauté)Quantitative Approximation Results for Sigma-Pi-Type Neural Network Operators (B Lenze)Local Interpolation Schemes — From Curves to Surfaces (D Levin)Some Results on Approximation by Smoothing Dm-Splines (M C L de Silanes) Readership: Applied mathematicians.

CHEBYSHEV POLYNOMIALS

Courier Dover Publications **This survey of the most important properties of Chebyshev polynomials encompasses several areas of mathematical analysis: - Interpolation theory - Orthogonal polynomials - Approximation theory - Numerical integration - Numerical analysis - Ergodic theory Starting with some definitions and descriptions of elementary properties, the treatment advances to examinations of extremal properties, the expansion of functions in a series of Chebyshev polynomials, and iterative properties. The final chapter explores selected algebraic and number theoretic properties of the Chebyshev polynomials. For advanced undergraduates and graduate students in mathematics Originally published in 1974, the text was updated in 1990; this reprint of the second edition corrects various errors and features new material.**

COMPUTING METHODS

ADIWES INTERNATIONAL SERIES IN THE ENGINEERING SCIENCES

Elsevier **Computing Methods, Volume I generalizes and details the methods involved in computer mathematics. The book has been developed in two volumes; Volume I contains Chapters 1 to 5, and Volume II encompasses Chapters 6 to 10. The first chapter in this volume deals with operation on approximate quantities, while the second chapter talks about the theory of interpolation and certain applications. Chapter 3 covers numerical differentiation and integration. The last two chapters discuss approximation and least square approximations. The text will be of great interest to college students majoring in mathematics or computer science.**

MULTIVARIATE APPROXIMATION AND INTERPOLATION

PROCEEDINGS OF AN INTERNATIONAL WORKSHOP HELD AT THE UNIVERSITY OF DUISBURG, AUGUST 14–18, 1989

Springer-Verlag

TOPICS IN MULTIVARIATE APPROXIMATION

Elsevier **Topics in Multivariate Approximation contains the proceedings of an international workshop on multivariate approximation held at the University of Chile in Santiago, Chile, on December 15-19, 1986. Leading researchers in the field discussed several problem areas related to multivariate approximation and tackled topics ranging from multivariate splines and fitting of scattered data to tensor approximation methods and multivariate polynomial approximation. Numerical grid generation and finite element methods were also explored, along with constrained interpolation and smoothing. Comprised of 22 chapters, this book first describes the application of Boolean methods of approximation in combination with the theory of right invertible operators to bivariate Fourier expansions. The reader is then introduced to ill-posed problems in multivariate approximation; interpolation of scattered data by radial functions; and shape-preserving surface interpolation. Subsequent chapters focus on approximation by harmonic functions; numerical generation of nested series of general triangular grids; triangulation methods; and inequalities arising from best local approximations in rectangles. A bibliography of multivariate approximation concludes the book. This monograph will be of interest to mathematicians.**

APPROXIMATION THEORY, WAVELETS AND APPLICATIONS

Springer Science & Business Media **Approximation Theory, Wavelets and Applications draws together the latest developments in the subject, provides directions for future research, and paves the way for collaborative research. The main topics covered include constructive multivariate approximation, theory of splines, spline wavelets, polynomial and trigonometric wavelets, interpolation theory, polynomial and rational approximation. Among the scientific applications were de-noising using wavelets, including the de-noising of speech and images, and signal and digital image processing. In the area of the approximation of functions the main topics include multivariate interpolation, quasi-interpolation, polynomial approximation with weights, knot removal for scattered data, convergence theorems in Padé theory, Lyapunov theory in approximation, Neville elimination as applied to shape preserving presentation of curves, interpolating positive linear operators, interpolation from a convex subset of Hilbert space, and interpolation on the triangle and simplex. Wavelet theory is growing extremely rapidly and has applications which will interest readers in the physical, medical, engineering and social sciences.**

THEORETICAL NUMERICAL ANALYSIS

Elsevier **Theoretical Numerical Analysis focuses on the presentation of numerical analysis as a legitimate branch of**

mathematics. The publication first elaborates on interpolation and quadrature and approximation. Discussions focus on the degree of approximation by polynomials, Chebyshev approximation, orthogonal polynomials and Gaussian quadrature, approximation by interpolation, nonanalytic interpolation and associated quadrature, and Hermite interpolation. The text then ponders on ordinary differential equations and solutions of equations. Topics include iterative methods for nonlinear systems, matrix eigenvalue problems, matrix inversion by triangular decomposition, homogeneous boundary value problems, and initial value problems. The publication takes a look at partial differential equations, including heat equation, stability, maximum principle, and first order systems. The manuscript is a vital source of data for mathematicians and researchers interested in theoretical numerical analysis.

PIECEWISE POLYNOMIAL INTERPOLATION AND APPROXIMATION

ON LAGRANGE POLYNOMIAL QUASI-INTERPOLATION

For H^{\infty} functions whose radial limits are almost everywhere continuous on the unit circle in the complex plane, we give an estimate, in terms of the average modulus of continuity, for approximation using Lagrange interpolating, and more generally quasi-interpolating, polynomials at the nth roots of unity. Our error estimate not only improves the existing results on Lagrange interpolation using the uniform modulus of continuity, but also gives an estimation for the Motzkin-Sharma quasi-interpolatory polynomial approximation. Furthermore, our results can be easily modified to give error estimations for more general interpolatory processes such as the Hermite-Fejér interpolation.

POLYNOMIAL INTERPOLATION AND APPROXIMATION OF REAL FUNCTIONS 2: SYMMETRICAL INTERPOLATION FOR THE TRIANGLE

This is the second paper in a series to discuss the approximation efficacy of polynomial interpolation of functions. In particular, the approximation accuracy depends sensitively on the locations of the interpolation nodes. We address the problem of finding the optimal symmetrical polynomial interpolation schemes for the triangle. The table for the symmetrical mean minimal interpolation sets for the triangle is given in this paper. An adaptive scheme for determining the interpolation order is also presented.

LEAST SQUARES APPROXIMATION AND INTERPOLATION BY POLYNOMIALS

TESI DI DOTTORATO

ERROR ESTIMATES FOR THE APPROXIMATION OF FUNCTIONS BY CERTINA INTERPOLATION POLYNOMIALS

CHEBYSHEV POLYNOMIALS

CRC Press **Chebyshev polynomials crop up in virtually every area of numerical analysis, and they hold particular importance in recent advances in subjects such as orthogonal polynomials, polynomial approximation, numerical integration, and spectral methods. Yet no book dedicated to Chebyshev polynomials has been published since 1990, and even that work focused primarily on the theoretical aspects. A broad, up-to-date treatment is long overdue. Providing highly readable exposition on the subject's state of the art, Chebyshev Polynomials is just such a treatment. It includes rigorous yet down-to-earth coverage of the theory along with an in-depth look at the properties of all four kinds of Chebyshev polynomials-properties that lead to a range of results in areas such as approximation, series expansions, interpolation, quadrature, and integral equations. Problems in each chapter, ranging in difficulty from elementary to quite advanced, reinforce the concepts and methods presented. Far from being an esoteric subject, Chebyshev polynomials lead one on a journey through all areas of numerical analysis. This book is the ideal vehicle with which to begin this journey and one that will also serve as a standard reference for many years to come.**

WEIGHTED POLYNOMIAL APPROXIMATION AND NUMERICAL METHODS FOR INTEGRAL EQUATIONS

Springer Nature **The book presents a combination of two topics: one coming from the theory of approximation of functions and integrals by interpolation and quadrature, respectively, and the other from the numerical analysis of operator equations, in particular, of integral and related equations. The text focusses on interpolation and quadrature processes for functions defined on bounded and unbounded intervals and having certain singularities at the endpoints of the interval, as well as on numerical methods for Fredholm integral equations of first and second kind with smooth and weakly singular kernel functions, linear and nonlinear Cauchy singular integral equations, and hypersingular integral equations. The book includes both classic and very recent results and will appeal to graduate students and researchers who want to learn about the approximation of functions and the numerical solution of operator equations, in particular integral equations.**

APPROXIMATION THEORY AND APPLICATIONS

Construction of elements of the relative chebyshev center. The numerical claculation of spline approximations on a binfinite. Global analysis in nonlinear approximation and its application to exponential approximation. Global analysis in nonlinear approximation and its application to exponential approximation. Simultaneous approximation and restricted chebyshev centers in function spaces. Quelques proprietes D'Une family D'operateurs positfs sur des espaces de functions relles definies presque partout sur ... Bell-Shaped basis functions for surface fitting. The n-Widhts of sets of analytic functions. Admissibility of quadrature formulas with random nodes. Convergence for operators of hyperbolic type. Explicit ... - extensions of functions of two variebles in a strip between two curves, or in a corner in IR

... Taylor interpolation of order n at the vertices of a triangle. Applications for hermite interpolation and finite elements. Jacobi projections. Oscillating monosplines of least uniform norm. Some applications and drawbacks of padé approximants. From dirac distributions to multivariate representation formulas. A new iterative method for the solution of systems nonlinear equations. Polynomials and rational functions. Quadrature formulae based on shape preserving interpolation. Optimal recovery among the polynomials. On cardinal spline interpolants. Approximation by lacunary polynomials: A converse theorem. An interpolatory rational approximation. Design problems for optimal surface interpolation. Open problems.

INTERPOLATION AND APPROXIMATION BY BÉZIER POLYNOMIALS

APPROXIMATION THEORY AND METHODS

Cambridge University Press **Most functions that occur in mathematics cannot be used directly in computer calculations. Instead they are approximated by manageable functions such as polynomials and piecewise polynomials. The general theory of the subject and its application to polynomial approximation are classical, but piecewise polynomials have become far more useful during the last twenty years. Thus many important theoretical properties have been found recently and many new techniques for the automatic calculation of approximations to prescribed accuracy have been developed. This book gives a thorough and coherent introduction to the theory that is the basis of current approximation methods. Professor Powell describes and analyses the main techniques of calculation supplying sufficient motivation throughout the book to make it accessible to scientists and engineers who require approximation methods for practical needs. Because the book is based on a course of lectures to third-year undergraduates in mathematics at Cambridge University, sufficient attention is given to theory to make it highly suitable as a mathematical textbook at undergraduate or postgraduate level.**

APPROXIMATION BY POLYNOMIALS WITH INTEGRAL COEFFICIENTS

American Mathematical Soc. **Results in the approximation of functions by polynomials with coefficients which are integers have been appearing since that of Pal in 1914. The body of results has grown to an extent which seems to justify this book. The intention here is to make these results as accessible as possible. The book addresses essentially two questions. The first is the question of what functions can be approximated by polynomials whose coefficients are integers and the second question is how well are they approximated (Jackson type theorems). For example, a continuous function f on the interval $-1,1$ can be uniformly approximated by polynomials with integral coefficients if and only if it takes on integral values at $-1,0$ and $+1$ and the quantity $f(1)+f(0)$ is divisible by 2. The results regarding the second question are very similar to the corresponding results regarding approximation by polynomials with arbitrary coefficients. In particular, nonuniform estimates in terms of the modules of continuity of the approximated function are obtained. Aside from the intrinsic interest to the pure mathematician, there is the likelihood of important applications to other areas of mathematics; for example, in the simulation of transcendental functions on computers. In most computers, fixed point arithmetic is faster than floating point arithmetic and it may be possible to take advantage of this fact in the evaluation of integral polynomials to create more efficient simulations. Another promising area for applications of this research is in the design of digital filters. A central step in the design procedure is the approximation of a desired system function by a polynomial or rational function. Since only finitely many binary digits of accuracy actually can be realized for the coefficients of these functions in any real filter the problem amounts (to within a scale factor) to approximation by polynomials or rational functions with integral coefficients.**