Chapter 1 : Analytic closure of sets of real hyperbolic polynomials with separated roots - PDF Free Downlo

This text presents easy to understand proofs of some of the most difficult results about polynomials. It encompasses a self-contained account of the properties of polynomials as analytic functions of a special kind.

Our results are motivated by recent considerations of Fisk and others of the interlacing-preserving linear operators on hyperbolic polynomials. We discuss closures of classes of hyperbolic polynomials with mesh minimal root separation bounded from below and of hyperbolic polynomials with logarithmic mesh minimal ratio of successive roots bounded from below. We also provide some examples and applications. As usual we will treat the zero polynomial as hyperbolic. A linear operator T: We say that polynomials P and Q of the same degree with roots correspondingly x1 , x2 ,. For more details, see [6]. Let A be an affine transformation, i. The following property of HP A due to Fisk [6] stimulated our further explorations of certain classes HP A and their closures, which we present in this paper. Theorem A [6, Lemma 8. This theorem has turned out to be an important result for problems concerning root separation, as can be seen from the recent results in [3â€"5,7]. We explain some of its consequences below and this will help to explain our motivation. The space HP Sb can be easily described. Hence Theorem A1 If a hyperbolicity preserver T commutes with all shift operators, then it does not decrease mesh of polynomials in HP. As a consequence of Theorem A we get straightforwardly the following earlier known facts. Indeed, differentiation commutes with all shift operators. This is a classic theorem, due to Riesz, but it was recorded by Stoyanoff [16]: The natural extension of this result can be obtained using the Hermiteâ€"Poulain theorem [13, p. The space HPTq can be easily described as well. Secondly, the polynomials P x and P q x interlace if and only if the minimal ratio of two roots of polynomial P is greater than q, i. Its well-known property is the following: Katkova, Shapiro, and Vishnyakova established in [11] the following result: Golitsyna Theorem A again gives a straightforward proof of this fact. Let Q be fixed and have all roots negative. Then, by Theorem A2 , it does not decrease logarithmic mesh. We know that differentiation preserves interlacing, however, it does not commute with dilatation operators. Instead the next equality holds: But it turns out that such weaker commutation property is sufficient for Theorem A to remain true. Before we state the corresponding results, we need to recall some facts about limits of polynomials in the topology of convergence on compact subsets of C.

Chapter 2 : CiteSeerX â€” Citation Query Analytic Theory of Polynomials

For monic polynomials fn(z) of degree n with prescribed Lp norm (1 Â£ p &oc) on the unit circle or supremum norm on die unit interval we determine bounded regions in the complex plane containing.

We prove that the Leech lattice is the unique densest lattice in R The proof combines human reasoning with computer verification of the properties of certain explicit polynomials. Liggett , " We introduce the class of strongly Rayleigh probability measures by means of geometric properties of their generating polynomials that amount to the stability of the latter. This class covers important models such as determinantal measures e. We show that strongly Rayleigh measures enjoy all virtues of negative dependence and we also prove a series of conjectures due to Liggett, Pemantle, and Wagner, respectively. Recall that a circular region in C is either an open or closed affine half-plane or the open or closed interior or exterior of a circle. For a proof of the following version we refer to [19, Theorem 2. The consecutive numbering of the publications is determined by their chronological order. The aim of this preprint series is to make new research rapidly available for scientific discussion. Therefore, the responsibility for the contents is solely due to the authors. The publications will be distrib The publications will be distributed by the authors. Show Context Citation Context This provides a natural framework for dealing with several long-standing fundamental problems, which we solve in a unified way. Theorem 9 Hermite-Biehler theorem. Moreover, h is strictly stable if and only if f and g are strict The Mahler measure of algebraic numbers: A survey of results for Mahler measure of algebraic numbers, and one-variable polynomials with integer coefficients is presented. Some generalisations are also mentioned, though n Some generalisations are also mentioned, though not to Mahler measure of polynomials in more than one variable. In Lee and Yang proposed the program of analyzing phase transitions in terms of zeros of partition functions. Linear operators preserving non-vanishing properties are an essential tool in this program as well as various contexts in complex analysis, probability theory, combinatorics, matrix t Linear operators preserving non-vanishing properties are an essential tool in this program as well as various contexts in complex analysis, probability theory, combinatorics, matrix theory. We characterize all linear operators on finite or infinite-dimensional spaces of multivariate polynomials preserving the property of being non-vanishing when the variables are in prescribed open circular domains. In particular, this supersedes [7, 9] and solves the higher dimensional counterpart of a long-standing classification problem originating from classical works of Hermite, Laguerre, Multivariate stable polynomials: SOC , " Univariate polynomials with only real roots, while special, do occur often enough that their properties can lead to interesting conclusions in diverse areas. The first part of this paper surveys some of the main results of this theory of multivariate stable polynomialsâ€”the most central of these results is the characterization of linear transformations preserving stability of polynomials. The second part presents various applications of this theory in complex analysis, matrix theory, probability and statistical mechanics, and combinatorics. We rely on the following essential fact at several points. Then f is e A multivariate polynomial is stable if it is nonvanishing whenever all variables have positive imaginary parts. We classify all linear partial differential operators in the Weyl algebra An that preserve stability. An important tool that we develop in the process is the higher dimensional generalizat We characterize all multivariate multiplier sequences as well as those of finite order. Using the latter we describe all operators in A1 that preserve univariate hyperbolic polynomials by means of determinants and homogenized symbols. Our methods also yield homotopical properties for symbols of linear stability preservers and a duality theorem showing that an operator in An preserves stability if and only if its Fischer-Fock adjoint does. Examples, applications to strict stability preservers and further directions are also discussed. Applications of stable polynomials to mixed determinants: Assertions 1 â€” 3 solve three important conjectures proposed by C. Johnson 20 years ago. Moreover, we substantially extend these results to tuples of matrix pencils and real stable polynomials. In the process, we establish unimodality properties in the sense of majorization for the coefficients of homogeneous real stable polynomials and as an application, we derive similar properties for symmetrized Fischer products of positive definite matrices. We also obtain Laguerre type inequalities for characteristic polynomials of principal submatrices of arbitrary Hermitian matrices that

considerably generalize a certain subset of the Hadamard-Fischer-Koteljanskii inequalities for principal minors of positive definite matrices. Finally, we propose Lax type problems for real stable polynomials and mixed determinants. Theorem 2 Hermite-Biehler theorem. We study the effect on the zeros of generating functions of sequences under certain non-linear transformations. A consequence is that if a polynomial has only real and non-positive zeros, then its Taylor coefficients form an infinitely log-concave sequence. Finally, we propose a new approach to a conjecture of Boros and Moll.

Chapter 3 : Account Suspended

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