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Elin Ottergren: Linear preservers of hyperbolic and stable polynomials

Sammanfattning

In this thesis we study linear operators on the polynomial space C[z] that preserve the set of hyperbolic polynomials. A hyperbolic polynomial is one with all real zeros, (hence an element of the Laguerre-P—lya class). We present some well known results such as the Gauss-Lucas theorem and discuss their importance in view of our topic. The main purpose of this thesis is to describe all finite order linear differential operators with polynomial coefficients that are hyperbolicity preserving (HPO). Quite recently some break through results regarding this has been made by Borcea, BrŠndŽn and Shapiro. And this has been accomplished by using properties of the Weyl algebra and the well known example of a Hilbert space - the Fischer-Fock space. Finally experiments are made to test a conjecture that states that all HPOs also preserve the property of classical majorization. We also give some attention to similar results concerning stability preserving operators - SPOs - i.e. operators that preserve stable polynomials. A stable polynomial is one with all zeros in the left half of the complex plane. This study will be restricted to the one-variable case even if a lot of the theory that we present extends to the multivariate case.