ANALYSIS SEMINAR

Asymptotics of polynomials orthogonal over the complex unit disk with respect to a positive polynomial weight

PART II

Erwin Miña–Diaz

Department of Mathematics, University of Mississippi

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Abstract: Consider the sequence \( \{ p_n(z) \}_{n=0}^{\infty} \) of polynomials of a complex variable \( z \) (\( p_n(z) \) of degree \( n \) and positive leading coefficient) that are orthonormal over the unit disk \( \mathbb{D} := \{ z : |z| < 1 \} \) with respect to a weight of the form \( |h(z)|^2 \), \( h(z) \) a polynomial without zeros in \( \mathbb{D} \), that is, satisfying

\[
\int_{\mathbb{D}} p_n(z) \overline{p_m(z)} |h(z)|^2 dx dy = \delta_{n,m}.
\]

We establish the behavior of \( p_n(z) \) as \( n \to \infty \) at every point of the complex plane. We shall also discuss the behavior that these formulas impose on the zeros of the polynomials \( p_n \). A comparison with similar, known results for polynomials orthogonal over the unit circle will be made, and future research problems/extensions will be discussed.

Students are welcome.