

Joint Seminar
Integrable System Seminar and
Algebra, Geometry & Mathematical Physics Seminar

Orthogonal polynomials on the unit circle
and spectral transformations

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Abstract

Let σ be a nontrivial measure supported on the unit circle ($\mathbb{T} = \{z : |z| = 1\}$). A family of monic polynomials $\{\Phi_n\}_{n \geq 0}$ satisfying

$$\int_{\mathbb{T}} \Phi_m(z) \Phi_n(z) d\sigma(z) = k_n \delta_{m,n}, \quad k_n \neq 0,$$

is said to be the monic orthogonal polynomials sequence (MOPS) associated with σ . Orthogonal polynomials on the unit circle have applications on stationary stochastic processes, filtering, random matrix theory, and spectral theory, among others. In this presentation, some perturbations to the measure σ will be analyzed, focusing on their effect on some mathematical objects related to their corresponding MOPS. In particular, we deal with the following transformations:

- (i) $d\tilde{\sigma} = |z - \alpha|^2 d\sigma$, $\alpha \in \mathbb{C}$ (Christoffel transformation)
- (ii) $d\tilde{\sigma} = d\sigma + M\delta_\alpha$, $M \in \mathbb{R}, |\alpha| = 1$ (Uvarov transformation)
- (iii) $d\tilde{\sigma} = \frac{1}{|z - \alpha|^2} d\sigma$, $|\alpha| \neq 1$ (Geronimus transformation).

A connection of such transformations with integrable systems will be presented, as well as some related open problems.

Date: **Friday, October 16, 2009**
Time: **3:00pm-4:00pm**
Place: **MAGC 1.302**

For further information, please contact Dr. Virgil Pierce via email at piercevu@utpa.edu.