ORTHOGONAL POLYNOMIALS AND SYMMETRIC FREUD WEIGHTS

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In this talk I will discuss orthogonal polynomials associated with symmetric Freud weights, in particular the sextic weight

$$\omega(x; t, \tau, \rho) = |x|^\rho \exp(-x^6 + \tau x^4 + t x^2), \tag{1}$$

with τ, t and $\rho > -1$ parameters. I will describe properties of the recurrence coefficients in the three-term recurrence relation associated with these orthogonal polynomials. For the sextic weight (1) the recurrence coefficients satisfy a fourth-order discrete equation which is the second member of the first discrete Painlevé hierarchy, also known as the string equation, and also satisfiy a coupled system of second-order, nonlinear differential equations. When $\rho = 0$, the weight (1) arises in the context of Hermitian matrix models and random symmetric matrix ensembles.

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