ICM 1998, Berlin, Aug. 18–27

Abstracts of Plenary and Invited Lectures

Section:

15. Numerical Analysis and Scientific Computing

1991 MS Classification: 42C05

Deift, Percy, Courant Institute, USA

Uniform asymptotics for orthogonal polynomials

The speaker will present the results of recent joint work with T. Kriecherbauer, K. T-R McLaughlin, S. Venakides and X. Zhou.
We consider asymptotics of orthogonal polynomials with respect to weights $e^{-Q(x)}dx$ on the real line where either
1) $Q(x)$ is a polynomial of even order with positive leading coefficient
or
2) $Q(x) = nV(x)$ where V is real analytic and $\frac{V(x)}{\log(1+x^2)} \to \infty$ as $|x| \to \infty$.
We formulate the orthogonal polynomial problem as a Riemann-Hilbert problem following the work of Fokas, Its and Kitaev. We employ the steepest descent type method introduced by Deift and Zhou, and further developed by Deift, Venakides and Zhou, in order to obtain uniform Plancherel-Rotach type asymptotics in the entire complex plane, as well as asymptotic formulae for the zeros, the leading coefficients and the recurrence coefficients of the orthogonal polynomials. These asymptotics are also used to prove various universality conjectures in the theory of random matrices.