Quantum integrability and Gromov-Witten theory of elliptic curves

The double ramification (DR) hierarchy, introduced by Buryak, is a Hamiltonian integrable hierarchy associated with Gromov-Witten (GW) theories and, more broadly, cohomological field theories. Building on Buryak-Rossi's quantization framework, which extends Kontsevich's deformation quantization, it is possible to construct a quantum DR hierarchy for GW theories. Notable examples include the quantum KdV and quantum Toda hierarchies, arising from the GW theories of a point and projective space, respectively.

In this work, we present our construction of the quantum DR hierarchy associated with the GW theory of elliptic curves, inspired by the foundational work of Okounkov and Pandharipande. Our approach leverages the holomorphic anomaly equation and quasimodularity techniques developed by Oberdieck and Pixton, extending them to address DR-type intersection numbers. Additionally, we incorporate recent advancements by Blot, Lewanski, and Shadrin on the DR/DZ equivalence conjecture to enrich our framework. This work provides new insights into the interplay between quasimodularity, quantum DR hierarchies, and elliptic curve GW theories.

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