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Br\'ezin–Gross–Witten numbers and Witten's intersection numbers: their combinatorics and uniform large genus asymptotics

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Br\'ezin–Gross–Witten (BGW) numbers and Witten's intersection numbers are two families of rational numbers, that both have physical origins, topological meanings and backgrounds from matrix models. Their partition functions are known to be particular tau-functions of the KdV hierarchy, satisfying Virasoro constraints. In view of integrable systems, the origin of the BGW numbers and Witten's intersection numbers goes back to bispectrality after Duistermaat and Gr\"unbaum. In this talk, we study combinatorics of these numbers, and discover and prove their uniform large genus asymptotics. Applications to the Painlev\'e II hierarchy and to the Painlev\'e I equation are given. The talk is based on joint works with Jindong Guo, Paul Norbury and Don Zagier.

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