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Genus expansion of matrix models vis exact relations between them

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Abstract

Recent advances in developing the technique of genus expansion for matrix models have demonstrated the remarkable universality of the geometrical approach. One and the same technique based on the spectral curve $E(x, y) = 0$ and the basic 1-differential ydx on this curve can be used to produce higher genus ($1/N$) corrections to one-, two-matrix models, to the (generalized) Kontsevich model, to the $2D$ topological anomaly, to generating function for Hurwitz numbers, etc. within the quantum-field-like diagrammatic model description. At the same time, there are *exact* relations (of a canonical transformation type) that connect different matrix models (the Kontsevich matrix model vis the Hermitian one-matrix model is the first and still the only known example). We discuss the possibility of constructing relations of this sort for other models from the above list.