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Sigma-models as Gross-Neveu models

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We consider the reformulation the sigma-models as a generalized Gross-Neveu models. In fact, this representation crucially simplifies the analysis of quantum aspects of sigma-models. We show, as simplest application, that in this formulation the derivation of the β -function of the sigma-models reduces to ordinary calculation of Feynman diagrams (as in ϕ^4 model), while in the usual formulation one needs more complicated tools (background field method, for example). We construct the Gross-Neveu representation for the sigma models, which target spaces are \mathbb{CP}^n and Grassmannians (include orthogonal and symplectic one). We also consider the connection of this representation with algebraic and complex geometry, theory of nilpotent orbits and integrability (potentially, on Riemann surfaces).

Primary author: KRIVOROL, Viacheslav (Institute of Theoretical and Mathematical Physics and Steklov Mathematical Institute, Moscow)

Co-author: Prof. BYKOV, Dmitri (Steklov Mathematical Institute of Russian Academy of Sciences and Institute of Theoretical and Mathematical Physics)

Presenter: KRIVOROL, Viacheslav (Institute of Theoretical and Mathematical Physics and Steklov Mathematical Institute, Moscow)

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