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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  $\beta$ -function of the sigma-models reduces to ordinary calculation of Feynman diagrams (as in  $\phi^4$  model), while in the usual formulation one need more complicated tools (background field method, for example). We construct the Gross-Neveu representation for the sigma models, which target spaces are  $\mathbb{C}P^n$  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).

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