

Multiloop calculations in supersymmetric theories with the higher covariant derivative regularization

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Most calculations of quantum correction in the supersymmetric theories are made with the dimensional reduction, which is a modification of the dimensional regularization. However, it is well known that the dimensional reduction is not self-consistent. A consistent regularization, which does not break the supersymmetry is the higher covariant derivative regularization. However, the integrals obtained with this regularization can not be usually calculated analytically. We discuss application of this regularization to the calculations in supersymmetric theories. In particular, it is demonstrated that integrals defining the beta-function are possibly integrals of total derivatives. This feature allows to explain the origin of the exact NSVZ beta-function, relating the beta-function with the anomalous dimensions of the matter superfields. However, integrals for the anomalous dimension should be calculated numerically.

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