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Analytical Regularization

We present a novel regularization scheme in quantum field theory, analytic regularization. In our regularization scheme, we modify the action such that convergence is guaranteed before quantization. In particular, using Riesz derivatives, we analytically continue the power of the kinetic term in the action leading to an analytic continuation of the power of the propagator. This power is then treated as the parameter that regulates the UV divergences of the theory. It is a regularization scheme in quantum field theory that modifies the power of the propagators of a theory. We explicitly demonstrate how our scheme self-consistently regularizes massless and massive ϕ^4 theory and, time permitted, discuss the consistency of our regularization scheme in gauge theories and their related Ward identities.

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