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PT-symmetric quantum field theory

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The field of PT-symmetric quantum mechanics began with a study of the
Hamiltonian $H = p^2 + x^2(ix)^\epsilon$. A surprising feature of this non-Hermitian
Hamiltonian is that its eigenvalues are discrete, real, and positive when $\epsilon \geq 0$. This talk examines the corresponding quantum-field-theoretic
Hamiltonian $H =$
$half(\partial\phi)^2 +$
$half\phi^2(i\phi)^\epsilon$ in
D-dimensional spacetime, where ϕ is a pseudoscalar field. For $0 \leq D < 2$ it is shown how to calculate the Green's functions as series in powers of ϵ directly from the Euclidean-space representation of the partition function. Exact expressions for the first few coefficients in this series for the vacuum energy density, the first four Green's functions, and the renormalized mass are derived. The remarkable spectral properties of PT-symmetric quantum
mechanics appear to persist in PT-symmetric quantum field theory.

Content of the contribution

Theory

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