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## Convergent perturbative series via finite path integral limits

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Perturbation theory is used extensively for solving problems in quantum mechanics and quantum field theory. In most cases, the perturbative series in powers of the coupling is an asymptotic series (it ultimately diverges). This is not an issue at weak coupling where one can make precise predictions by computing a few lower orders. However, this procedure fails completely at strong coupling. In this work, we show that one can obtain an absolutely convergent perturbative series in powers of the coupling if one uses finite path integral limits. Therefore, it can be used at strong coupling (just more terms are needed). Remarkably, one can prove in some cases that there is a duality between the perturbative series and a different series based on inverse powers of the coupling (which converges quickly at strong coupling). We illustrate the procedure for  $\lambda \phi^{4}$  theory in lower dimensions: a basic integral involving quadratic and quartic terms and the more dynamical scenario of the quantum anharmonic oscillator.

## Secondary track

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