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Scaling, renormalisation and accuracy of perturbation calculations

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Abstract

For certain eigenvalue problems which lead to divergent Rayleigh–Schrödinger perturbation series, energy estimates of acceptable accuracy may be obtained easily in first order by optimising a variational scale factor. Some simple calculations on the quartic anharmonic oscillator and on the quadratic Zeeman effect show errors which are generally quite small over a very wide range of perturbation parameter values.