

Uniform Asymptotic Approximation Method with Pöschl–Teller Potential

Tuesday 7 May 2024 14:45 (15 minutes)

We study analytical approximate solutions for second-order homogeneous differential equations with the existence of only two turning points (but without poles) by using the uniform asymptotic approximation (UAA) method. To be more concrete, we consider the Pöschl-Teller (PT) potential, for which analytical solutions are known. Depending on the values of the parameters involved in the PT potential, we find that the upper bounds of the errors of the approximate solutions in general are $\leq 0.15\sim 10\%$ for the first-order approximation of the UAA method. The approximations can be easily extended to high orders, for which the errors are expected to be much smaller. Such obtained analytical solutions can be used to study cosmological perturbations in the framework of quantum cosmology as well as quasi-normal modes of black holes.

Authors: PAN, Rui (Baylor); SAEED, Jamal (Baylor); CLEAVER, Gerald (Baylor University, Waco, Texas, USA); WANG, Anzhong (Baylor University)

Presenter: PAN, Rui (Baylor)

Session Classification: Cosmology