

Parametric symmetries in exactly solvable real and PT symmetric complex potentials

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Abstract

In this paper, we discuss the parametric symmetries in different exactly solvable systems characterized by real or complex PT symmetric potentials. We focus our attention on the conventional potentials such as the generalized Pöschl Teller (GPT), Scarf-I and PT symmetric Scarf-II which are invariant under certain parametric transformations. The resulting set of potentials are shown to yield a completely different behavior of the bound state solutions. Further the supersymmetric (SUSY) partner potentials acquire different forms under such parametric transformations leading to new sets of exactly solvable real and PT symmetric complex potentials. These potentials are also observed to be shape invariant (SI) in nature. We subsequently take up a study of the newly discovered rationally extended SI Potentials, corresponding to the above mentioned conventional potentials, whose bound state solutions are associated with the exceptional orthogonal polynomials (EOPs). We discuss the transformations of the corresponding Casimir operator employing the properties of the $so(2, 1)$ algebra.