Orthogonal Polynamials for Continuous and discrete Painleve'equations

A Thesis

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ABSTRACT

This thesis studies Painleve' equations and their connection to orthogonal polynomials. It is divided into two parts: the first part discusses the relationship between semi classical Laguerre orthogonal polynomials and fourth Painleve' (PVI) equation, then builds new orthogonal polynomials using rational solutions to PVI equation which were constructed from Backlund transformation. On the other hand, using the coefficients of three terms recurrence relation for orthogonal polynomials, we can find rational solutions to some forms of PVI equation.

The second part, reviews Koornwinder's generalization of Laguerre polynomials with their properties then we use the same idea of generalizion to the semi classical Lagaurre weight and develop some results concerning the iterative relationship of orthogonal polynomials to get coefficients by the Hankel determinant .