On some applications of pseudoanalytic function theory to the Schrödinger equation

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Given a nonvanishing particular solution of a two-dimensional stationary Schrödinger equation with a real valued potential we reduce this equation to a Vekua equation describing generalized analytic (or pseudoanalytic) functions. Application of Bers' theory of pseudoanalytic functions allows us to obtain new results for the Schrödinger equation such as analogues of Cauchy's integral theorem and Morera's theorem, a simple procedure for constructing infinite series of explicitly obtained exact solutions which in some cases represent perturbed Taylor's series and are complete function systems in the kernel of the Schrödinger operator in a bounded domain of interest. We show a simple relationship between solutions of the Schrödinger equation and the so-called *p*-analytic functions, complex valued functions $\Phi = u + iv$ whose components satisfy the system

(1)
$$u_x = \frac{1}{p}v_y, \qquad u_y = -\frac{1}{p}v_x$$

where p is a given positive function of x and y which is supposed to be continuously differentiable. We also analyse some applications of this new bridge between the two theories.