
Analytic solutions of a class of nonlinear partial differential equations

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Abstract

A general class of nonlinear partial differential equations, which can be connected with wave-type equations and Laplace-type equations, is studied by use of a functional-analytic technique. The results establish primarily the existence and uniqueness of bounded solutions in the two-dimensional Hardy–Lebesgue space of analytic functions with independent variables lying in the open unit disc, although they can be simply modified in order to increase the definition domain of the established solution. The proofs have a constructive character enabling the determination of concrete and easily verifiable conditions, as well as the determination of the coefficients appearing in the power series solution. Illustrative examples are given concerning the sine–Gordon equation, the Klein–Gordon equation, as well as equations with nonlinear terms of algebraic, exponential and logistic type.

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