Contact Geometry and Nonlinear Differential Equations (Encyclopedia of Mathematics and its Applications)

Alexei Kushner, Valentin Lychagin, Vladimir Rubtsov

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Methods from contact and symplectic geometry can be used to solve highly non-trivial nonlinear partial and ordinary differential equations without resorting to approximate numerical methods or algebraic computing software. This book explains how it's done. It combines the clarity and accessibility of an advanced textbook with the completeness of an encyclopedia. The basic ideas that Lie and Cartan developed at the end of the nineteenth century to transform solving a differential equation into a problem in geometry or algebra are here reworked in a novel and modern way. Differential equations are considered as a part of contact and symplectic geometry, so that all the machinery of Hodge-deRham calculus can be applied. In this way a wide class of equations can be tackled, including quasi-linear equations and Monge-Ampere equations (which play an important role in modern theoretical physics and meteorology).

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