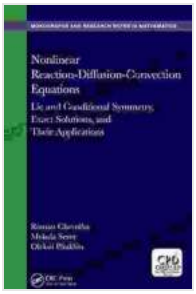
Lie and Conditional Symmetry: Exact Solutions and Their Applications | Chapman

Abstract

This article provides an overview of the theory of Lie and conditional symmetry, and their applications to finding exact solutions of differential equations. Lie symmetry is a powerful tool for finding exact solutions of differential equations, as it allows one to reduce the order of the equation by finding a transformation that leaves the equation invariant. Conditional symmetry is a generalization of Lie symmetry that allows one to find exact solutions of differential equations that are not invariant under any transformation.



Nonlinear Reaction-Diffusion-Convection Equations: Lie and Conditional Symmetry, Exact Solutions and Their Applications (Chapman & Hall/CRC Monographs and Research Notes in Mathematics) by Riley Edwards

4.7 out of 5

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Print length	: 258 pages
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Differential equations are used to model a wide variety of physical phenomena, from the motion of planets to the flow of fluids. Finding exact

solutions of differential equations is often a difficult problem, but it is essential for understanding the behavior of the system being modeled.

Lie symmetry is a powerful tool for finding exact solutions of differential equations. Lie symmetry is based on the idea of finding a transformation that leaves the equation invariant. If such a transformation can be found, then the order of the equation can be reduced by one. This can make it much easier to find exact solutions of the equation.

Conditional symmetry is a generalization of Lie symmetry that allows one to find exact solutions of differential equations that are not invariant under any transformation. Conditional symmetry is based on the idea of finding a transformation that leaves the equation invariant under certain conditions. If such a transformation can be found, then the equation can be reduced to a system of lower order equations that can be more easily solved.

Lie Symmetry

Lie symmetry is based on the idea of finding a transformation that leaves a differential equation invariant. If such a transformation can be found, then the order of the equation can be reduced by one. This can make it much easier to find exact solutions of the equation.

To find a Lie symmetry of a differential equation, we first need to find the infinitesimal generator of the symmetry. The infinitesimal generator is a vector field that generates the transformation that leaves the equation invariant.

Once we have found the infinitesimal generator of the symmetry, we can use it to reduce the order of the equation. To do this, we simply apply the

infinitesimal generator to the equation and set the result equal to zero. This will give us a system of lower order equations that can be more easily solved.

Conditional Symmetry

Conditional symmetry is a generalization of Lie symmetry that allows one to find exact solutions of differential equations that are not invariant under any transformation. Conditional symmetry is based on the idea of finding a transformation that leaves the equation invariant under certain conditions. If such a transformation can be found, then the equation can be reduced to a system of lower order equations that can be more easily solved.

To find a conditional symmetry of a differential equation, we first need to find the conditional infinitesimal generator of the symmetry. The conditional infinitesimal generator is a vector field that generates the transformation that leaves the equation invariant under certain conditions.

Once we have found the conditional infinitesimal generator of the symmetry, we can use it to reduce the order of the equation. To do this, we simply apply the conditional infinitesimal generator to the equation and set the result equal to zero. This will give us a system of lower order equations that can be more easily solved.

Applications

Lie and conditional symmetry have been used to find exact solutions of a wide variety of differential equations. Some of the applications of Lie and conditional symmetry include:

* Finding exact solutions of nonlinear partial differential equations * Finding exact solutions of systems of differential equations * Finding exact solutions of differential equations with boundary conditions * Finding exact solutions of differential equations with initial conditions

Lie and conditional symmetry are powerful tools for finding exact solutions of differential equations. They can be used to find exact solutions of a wide variety of differential equations, including nonlinear partial differential equations, systems of differential equations, and differential equations with boundary conditions or initial conditions.

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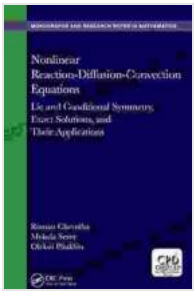
Lie and conditional symmetry are an essential tool for anyone who is interested in finding exact solutions of differential equations. They can be used to find exact solutions of a wide variety of differential equations, and they can make it much easier to understand the behavior of the system being modeled.



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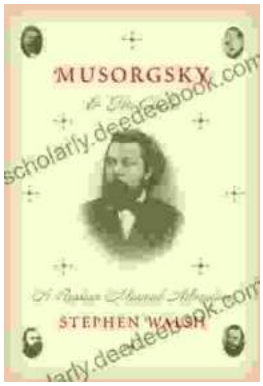

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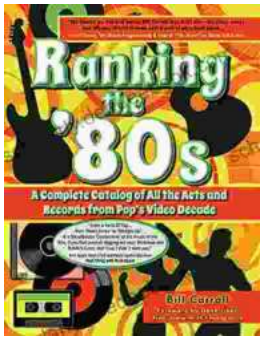

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