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Grüne, Lars; Junge, Oliver

**Ordinary differential equations. An introduction from the dynamical systems perspective. (Gewöhnliche Differentialgleichungen. Eine Einführung aus der Perspektive der dynamischen Systeme.)** (German)

Vieweg Studium: Bachelorkurs Mathematik. Wiesbaden: Vieweg+Teubner. xi, 243 p. EUR 24.90 (2009).

This introduction to ordinary differential equations (ODEs) is modern two aspects:

1) It emphasizes the ‘dynamical systems’ point of view, i.e., the consideration of all solutions of a given equation, their qualitative behavior and their geometric/topological structure in phase space.

2) Numerical exploration of ODEs is introduced along with the analytical theory (this corresponds to present-day methods of research).

Both Maple and Matlab routines for numerical integration are discussed in two appendices. After classical introductory themes like existence and uniqueness, linear equations, continuous and differentiable dependence, elementary solution methods, the authors present numerical schemes. The second part of the book treats dynamical topics like (linearized and Liapunov) stability, Poincaré-Bendixson-theory, attractors and bifurcations, Hamiltonian systems. The last chapter gives interesting applications from different natural sciences. Each chapter concludes with a number of exercises, some of which are numerical experiments.

The relatively large number of topics has the logical consequence that most of them are touched somewhat briefly – quite natural for an introduction. A typical lecture on ODEs will not exactly follow the book, but have considerable overlap with its contents. Thus it certainly provides a valuable companion for the students, also in view of the price. It seems that the book is currently available in German language only.

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*Keywords:*

introduction to ordinary differential equations; dynamical systems; numerical methods; applications in natural sciences

*Classification :*

\*34-01 Textbooks (ordinary differential equations)