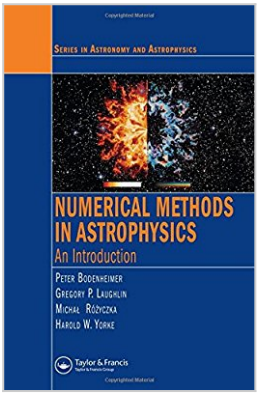

Numerical Methods in Astrophysics: An Introduction (Series in Astronomy and Astrophysics)

By Peter Bodenheimer, Gregory P. Laughlin, Michal Rozyczka, Tomasz Plewa, Harold. W Yorke, Harold W. Yorke

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Numerical Methods in Astrophysics: An Introduction outlines various fundamental numerical methods that can solve gravitational dynamics, hydrodynamics, and radiation transport equations. This resource indicates which methods are most suitable for particular problems, demonstrates what the accuracy requirements are in numerical simulations, and suggests ways to test for and reduce the inevitable negative effects.

After an introduction to the basic equations and derivations, the book focuses on practical applications of the numerical methods. It explores hydrodynamic problems in one dimension, *N*-body particle dynamics, smoothed particle hydrodynamics, and stellar structure and evolution. The authors also examine advanced techniques in grid-based hydrodynamics, evaluate the methods for calculating the gravitational forces in an astrophysical system, and discuss specific problems in grid-based methods for radiation transfer. The book incorporates brief user instructions and a CD-ROM of the numerical codes, allowing readers to experiment with the codes to suit their own needs.

With numerous examples and sample problems that cover a wide range of current research topics, this highly practical guide illustrates how to solve key astrophysics problems, providing a clear introduction for graduate and undergraduate students as well as researchers and professionals.

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Editorial Review

Review

… a very thorough introduction … the book is ideal for a postgraduate student just beginning a Ph.D. in numerical astrophysics or for an undergraduate with a numerical project. However, it also offers more advanced researchers and professionals [with] a clear and useful reminder of the important issues involved in numerical algorithms. … The codes make an interesting addition to the book in that they allow the reader to actually try out … some of the numerical algorithms discussed in the book. …
?Matthew Bate, *Geophysical and Astrophysical Fluid Dynamics*

The sweep of the book is impressive given its size. Even with the space constraint, room has been found for excellent discussions of code stability, starting with very simple examples, and including nice comparative discussions for various techniques . . . This is a most welcome and carefully thought out book that should help in the search for deeper subterranean seams.
?James Collett, *Physical Sciences Educational Review*, 2007, Vol. 8, No. 1

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