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Descrizione fisica	1 online resource (XIII, 345 p. 90 illus., 71 illus. in color.)
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Disciplina	530.15
Soggetti	Physics Observations, Astronomical Astronomy—Observations Astrophysics Mathematical Methods in Physics Astronomy, Observations and Techniques Numerical and Computational Physics, Simulation Astrophysics and Astroparticles
Lingua di pubblicazione	Inglese
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Nota di contenuto	Preface -- Part I Preliminaries -- 1 Complex numbers -- 2 Complex function theory -- 3 Vectors and linear algebra -- 4 Linear partial differential equations -- Part II Methods of approximation -- 5 Projections and minimal distances -- 6 Spectral methods and signal analysis -- 7 Root finding -- 8 Finite differencing: differentiation and integration -- 9 Perturbation theory, scaling and turbulence -- Part III Selected topics -- 10 Thermodynamics of N-body systems -- 11 Accretion flows onto black holes -- 12 Rindler observers in astrophysics and cosmology -- A Some units and constant -- B (z) and (z) functions.
Sommario/riassunto	This textbook provides students with a solid introduction to the techniques of approximation commonly used in data analysis across physics and astronomy. The choice of methods included is based on their usefulness and educational value, their applicability to a broad range of problems and their utility in highlighting key mathematical concepts. Modern astronomy reveals an evolving universe rife with

transient sources, mostly discovered - few predicted - in multi-wavelength observations. Our window of observations now includes electromagnetic radiation, gravitational waves and neutrinos. For the practicing astronomer, these are highly interdisciplinary developments that pose a novel challenge to be well-versed in astroparticle physics and data-analysis. The book is organized to be largely self-contained, starting from basic concepts and techniques in the formulation of problems and methods of approximation commonly used in computation and numerical analysis. This includes root finding, integration, signal detection algorithms involving the Fourier transform and examples of numerical integration of ordinary differential equations and some illustrative aspects of modern computational implementation. Some of the topics highlighted introduce the reader to selected problems with comments on numerical methods and implementation on modern platforms including CPU-GPU computing. Developed from lectures on mathematical physics in astronomy to advanced undergraduate and beginning graduate students, this book will be a valuable guide for students and a useful reference for practicing researchers. To aid understanding, exercises are included at the end of each chapter. Furthermore, some of the exercises are tailored to introduce modern symbolic computation.
