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	Nota di contenuto	Introduction -- Part I -- Canonical Projectile Problem: Finding the Escape Velocity of the Earth -- Of Mites and Models -- Canonical Soap Film Problem -- Heat Conduction in a Finite Bar with a Linear Source -- Heat Conduction in a Semi-Infinite Bar -- Initiation of Cellular Slime Mold Aggregation Viewed as an Instability -- Chemical Turning Patterns and Diffusive Instabilities -- Part II -- Governing Equations of Fluid Mechanics -- Boundary Conditions for Fluid Mechanics -- Subsonic Sound Waves Viewed as a Linear Perturbation in an Inviscid Fluid -- Potential Flow Past a Circular Cylinder of a Homogeneous Inviscid Fluid -- Viscous Fluid Flows -- Blasius Flow Past a Flat Plate -- Part III -- Rayleigh-Bernard Natural Convection Problem -- Heat Conduction in a Finite Bar with a Nonlinear Source -- Nonlinear Optical Ring-Cavity Model Driven by a Gas Laser -- Vegetative Flat Dryland Rhombic Pattern Formation Driven by Root Suction -- Part IV -- Calculus Variations Revisited plus the Gamma and Bessel Functions -- Alternate Methods of Solution for Heat and Wave Equation Problems --

Finite Mathematical Models -- Concluding Capstone Problems.

Sommario/riassunto

This text demonstrates the process of comprehensive applied mathematical modeling through the introduction of various case studies. The case studies are arranged in increasing order of complexity based on the mathematical methods required to analyze the models. The development of these methods is also included, providing a self-contained presentation. To reinforce and supplement the material introduced, original problem sets are offered involving case studies closely related to the ones presented. With this style, the text's perspective, scope, and completeness of the subject matter are considered unique. Having grown out of four self-contained courses taught by the authors, this text will be of use in a two-semester sequence for advanced undergraduate and beginning graduate students, requiring rudimentary knowledge of advanced calculus and differential equations, along with a basic understanding of some simple physical and biological scientific principles. .