Essential Partial Differential Equations: Analytical and Computational Aspects (Springer Undergraduate Mathematics Series)

David F. Griffiths, John W. Dold, David J. Silvester

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This volume provides an introduction to the analytical and numerical aspects of partial differential equations (PDEs). It unifies an analytical and computational approach for these; the qualitative behaviour of solutions being established using classical concepts: maximum principles and energy methods.

Notable inclusions are the treatment of irregularly shaped boundaries, polar coordinates and the use of flux-limiters when approximating hyperbolic conservation laws. The numerical analysis of difference schemes is rigorously developed using discrete maximum principles and discrete Fourier analysis. A novel feature is the inclusion of a chapter containing projects, intended for either individual or group study, that cover a range of topics such as parabolic smoothing, travelling waves, isospectral matrices, and the approximation of multidimensional advection–diffusion problems.

The underlying theory is illustrated by numerous examples and there are around 300 exercises, designed to promote and test understanding. They are starred according to level of difficulty. Solutions to odd-numbered exercises are available to all readers while even-numbered solutions are available to authorised instructors.

Written in an informal yet rigorous style, *Essential Partial Differential Equations* is designed for mathematics undergraduates in their final or penultimate year of university study, but will be equally useful for students following other scientific and engi

neering disciplines in which PDEs are of practical importance. The only prerequisite is a familiarity with the basic concepts of calculus and linear algebra.

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