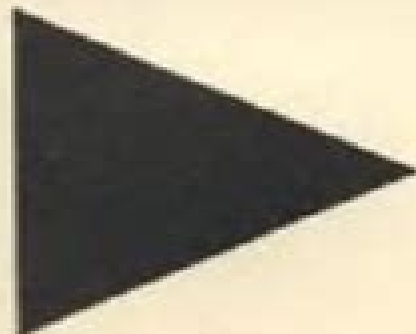


Solutions of Laplace's Equation

D. R. Bland



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Solutions Of Laplaces Equation

James L. Blue



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Solutions of Laplace's Equation D. R. Bland, 2012-12-06 THIS book is an introduction both to Laplace's equation and its solutions and to a general method of treating partial differential equations Chapter 1 discusses vector fields and shows how Laplace's equation arises for steady fields which are irrotational and solenoidal In the second chapter the method of separation of variables is introduced and used to reduce each partial differential equation Laplace's equation in different coordinate systems to three ordinary differential equations Chapters 3 and 5 are concerned with the solutions of two of these ordinary differential equations which lead to treatments of Bessel functions and Legendre polynomials Chapters 4 and 6 show how such solutions are combined to solve particular problems This general method of approach has been adopted because it can be applied to other scalar and vector fields arising in the physical sciences special techniques applicable only to the solutions of Laplace's equation have been omitted In particular generating functions have been relegated to exercises After mastering the content of this book the reader will have methods at his disposal to enable him to look for solutions of other partial differential equations The author would like to thank Dr W Ledermann for his criticism of the first draft of this book D R BLAND The University Sussex v Contents Preface page v 1 Occurrence and Derivation of Laplace's Equation 1 Situations in which Laplace's equation arises 1 2 Laplace's equation in orthogonal curvilinear coordinates 8 3 **Solutions of Laplace's Equation** D. R. Bland, 1961-05-12 THIS book is an introduction both to Laplace's equation and its solutions and to a general method of treating partial differential equations Chapter 1 discusses vector fields and shows how Laplace's equation arises for steady fields which are irrotational and solenoidal In the second chapter the method of separation of variables is introduced and used to reduce each partial differential equation Laplace's equation in different coordinate systems to three ordinary differential equations Chapters 3 and 5 are concerned with the solutions of two of these ordinary differential equations which lead to treatments of Bessel functions and Legendre polynomials Chapters 4 and 6 show how such solutions are combined to solve particular problems This general method of approach has been adopted because it can be applied to other scalar and vector fields arising in the physical sciences special techniques applicable only to the solutions of Laplace's equation have been omitted In particular generating functions have been relegated to exercises After mastering the content of this book the reader will have methods at his disposal to enable him to look for solutions of other partial differential equations The author would like to thank Dr W Ledermann for his criticism of the first draft of this book D R BLAND The University Sussex v Contents Preface page v 1 Occurrence and Derivation of Laplace's Equation 1 Situations in which Laplace's equation arises 1 2 Laplace's equation in orthogonal curvilinear coordinates 8 3 *Solutions of Laplace's Equation* David Russell Bland, 1961 *Solutions of Laplace's Equation* D.R. Bland, 1972 **Solutions of Laplace's Equation** D. R. Bland, 1967 **Continuous Solutions of Laplace's Equation in Two Variables** Wiley A. Johnson, 1968 **Block Method for Solving the Laplace Equation and for Constructing Conformal Mappings** Evgenii A.

Volkov,2017-07-28 This book presents a new efficient numerical analytical method for solving the Laplace equation on an arbitrary polygon This method called the approximate block method overcomes indicated difficulties and has qualitatively more rapid convergence than well known difference and variational difference methods The block method also solves the complicated problem of approximate conformal mapping of multiply connected polygons onto canonical domains with no preliminary information required The high precision results of calculations carried out on the computer are presented in an abundance of tables substantiating the exponential convergence of the block method and its strong stability concerning the rounding off of errors

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Approximate Solutions to Laplace's Equation Sebastian F. Catalano,1956

Numerical Scheme for the Solution to Laplace's Equation Using Local Conformal Mapping Techniques Cynthia Anne Sabonis,2014

Abstract This paper introduces a method to determine the pressure in a fixed thickness smooth periodic domain namely a lead over pleat cartridge filter Finding the pressure within the domain requires the numerical solution of Laplace s equation the first step of which is approximating by interpolation the curved portions of the filter to a circle in the xy plane A conformal map is then applied to the filter transforming the region into a rectangle in the uv plane A finite difference method is introduced to numerically solve Laplace s equation in the rectangular domain There are currently methods in existence to solve partial differential equations on non regular domains In a method employed by Monchmeyer and Muller a scheme is used to transform from cartesian to spherical polar coordinates Monchmeyer and Muller stress that for non linear domains extrapolation of existing cartesian difference schemes may produce incorrect solutions and therefore a volume centered discretization is used A difference scheme is then derived that relies on mean values This method has second order accuracy Rosenfeld Moshe Kwak Dochan 1989 The method introduced in this paper is based on a 7 point stencil which takes into account the unequal spacing of the points From all neighboring pairs a linear system of equations is constructed which takes into account the periodic domain This method is solved by standard iterative methods The solution is then mapped back to the original domain with second order accuracy The method is then tested to obtain a solution to a domain which satisfies $y \sin x$ at the center a shape similar to that of a lead over pleat cartridge filter As a result a model for the pressure distribution within the filter is obtained

The Numerical Solution of Laplace's Equation George Shortley,Royal Weller,1938

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