Contents

Introduction xi

Chapter 1. Simultaneous Linear Equations
  The GLOBAL.H File 1
  The General Vectors and Matrices 2
  The Gauss-Jordan Elimination Method 7
  The Gauss-Seidel Method 7
  The LU Decomposition Method 7
  The C Source Code 7
  The C++ Source Code 17
  The C Test Program 24
  The C++ Test Program 28

Chapter 2. Solving Nonlinear Equations 33
  The Bisection Method 34
  Newton’s Method 34
  The Richmond Method 36
  The Combined Method 37
  Newton’s Multiroot Method 37
  Deflating Polynomial Method 38
  The Lin-Bairstow Method 39
  Solving Multiple Nonlinear Equations 40
  Newton’s Method for Multiple Equations 41
  The C Functions 41

Chapter 3. Interpolation 61
  The Lagrangian Interpolation 61
  The Barycentric Interpolation 62
  Newton’s Divided Difference Interpolation 64
  The Newton Difference Method 64
  The Cubic Spline Interpolation Method 65
  The C Source Code 66
Chapter 4. Numerical Differentiation

The Forward/Backward Difference Method
The Central Difference Method
The Extended Central Difference Method
The C Source Code

Chapter 5. Numerical Integration

Simpson's Method
Simpson's Alternate Extended Rule
The Gaussian Quadrature Methods
Gauss-Legendre Quadrature
The Gauss-Laguerre Quadrature
The Gauss-Hermite Quadrature
The Gauss-Chebyshev Quadrature
The Romberg Method
The C Source Code

Chapter 6. Solving Ordinary Differential Equations

The Runge-Kutta Method
The Runge-Kutta-Gill Method
The Runge-Kutta-Fehlberg Method
The C Source Code

Chapter 7. Optimization

The Bisection Method
Newton's Method
The Golden Section Search Method
The Quadratic Interpolation Method
The Cubic Interpolation Method
The Simplex Method
Newton's Method for Sequential Optimization
The C Source Code
The Test Program

Chapter 8. Basic Statistics

The Mean and Standard Deviation
The Confidence Intervals
The First Four Moments
Testing Sample Means
The C Source Code
The C++ Source Code
The C Test Program
The C++ Test Program

Chapter 9. The ANOVA Tests

The One-Way ANOVA
The Two-Way ANOVA