

Contents

Preface *ix*

1

Introduction *1*

Section 1-1. Elements of the BASIC Language	<i>1</i>
Section 1-2. Discontinuous Functions: The IF-THEN Statement	<i>8</i>
Section 1-3. The FOR-NEXT Loop	<i>13</i>
Section 1-4. The Subroutine: The User-Defined Function	<i>21</i>
Section 1-5. Recurrence Formulas: Legendre Polynomials ...	<i>23</i>
Section 1-6. Subscripted Variables	<i>25</i>

2

Roots of Equations *33*

Section 2-1. The Method of Iteration	<i>33</i>
Section 2-2. The Newton-Raphson Method	<i>42</i>

Section 2-3.	The Secant Method	45
Section 2-4.	Roots of Equations by Lagrange Interpolation ...	48
Section 2-5.	Quadratic Equations	51
Section 2-6.	Cubic Equations	53
Section 2-7.	Quartic Equations	59

3

Some Higher Transcendental Functions 66

Section 3-1.	The Sine Integral and the Cosine Integral	66
Section 3-2.	The Exponential Integrals	69
Section 3-3.	The Error Function	75
Section 3-4.	Complete Elliptic Integrals	76
Section 3-5.	The Factorial Function	79
Section 3-6.	Bessel Functions	80

4

Numerical Integration 88

Section 4-1.	Simpson's Rule	89
Section 4-2.	Gauss Integration	93
Section 4-3.	Romberg Integration	100
Section 4-4.	Integrals with Discontinuous Integrands	107
Section 4-5.	Integrals with Infinite Intervals	111

5

Differential Equations 116

Section 5-1.	First-Order Differential Equations	116
Section 5-2.	Systems of Differential Equations: Second-Order Differential Equations	124
Section 5-3.	Fourth-Order Differential Equations	132
Section 5-4.	Boundary Value Problems	137

6

Matrices and Simultaneous Equations 144

Section 6-1.	Simultaneous Linear Algebraic Equations	144
Section 6-2.	Matrix Algebra	154
Section 6-3.	Determinants	165
Section 6-4.	Matrix Eigenvalues	168

Appendix: Numerical Methods *182*

Section A-1. Gauss Integration *182*
Section A-2. Differential Equations *188*

References *192*

Suggested Solutions to Selected
Problems *194*

Index *203*