

CONTENTS

<i>Preface</i>	ix
<i>Acknowledgments</i>	xi

Chapter 1 Basic Aspects of Numerical Computations

1.1 Numerical Algorithms	1
1.2 Unstable Problems (Ill-Conditioning)	8
1.3 Unstable Methods	11
Suggestions for Further Reading	17

Chapter 2 Computer Arithmetic

2.1 Number Representation	18
2.2 Floating Point Numbers	22
2.3 Arithmetic Operations	30
2.4 Errors in Computer Arithmetic	40
2.5 Analysis of Errors	47
Suggestions for Further Reading	59

Chapter 3 Evaluation of Functions

3.1 Summation	60
3.2 Polynomial Evaluation	68
3.3 Rational and Transcendental Functions	77
3.4 Avoiding Subtractive Cancellation	84
Suggestions for Further Reading	88

Chapter 4 Interpolation and Approximation

4.1 Polynomial Interpolation	89
4.2 Least Squares Approximation	100
4.3 Spline Interpolation	114
Suggestions for Further Reading	126

Chapter 5 Differentiation and Integration

5.1	Numerical Differentiation	127
5.2	Numerical Integration—Newton–Cotes Formulas	137
5.3	Numerical Integration—Gaussian Methods	147
5.4	Romberg Integration	156
	Suggestions for Further Reading	161

Chapter 6 Systems of Linear Equations

6.1	Basic Concepts	162
6.2	Gaussian Elimination	167
6.3	Matrix Applications of Gaussian Elimination	178
6.4	Rounding Error Analysis	188
6.5	Error Estimates and Accuracy Improvement	197
6.6	Efficiency Estimates	202
6.7	Error Estimates—Matrix Methods	205
6.8	Iterative Methods	213
	Suggestions for Further Reading	230

Chapter 7 Nonlinear Equations

7.1	Basic Methods	231
7.2	Convergence Results	245
7.3	Stability and Effects of Rounding Errors	251
7.4	Efficiency—Rates of Convergence	260
7.5	Roots of Polynomials	268
	Suggestions for Further Reading	282

Chapter 8 Ordinary Differential Equations

8.1	Differential and Difference Equations	283
8.2	Basic Methods	294
8.3	Error Estimates	306
8.4	Practical Aspects of Solving Differential Equations	320
8.5	Boundary Value Problems	326
	Suggestions for Further Reading	333

<i>Appendix</i>	334
<i>Bibliography</i>	336
<i>Index</i>	339