

Contents

Preface	ix
1 Introduction to Computer Algebra	1
1.1 Computer Algebra and Computer Algebra Systems	1
1.2 Applications of Computer Algebra	10
2 Elementary Concepts of Computer Algebra	29
2.1 Mathematical Pseudo-language (MPL)	29
2.2 Expression Evaluation	49
2.3 Mathematical Programs	58
2.4 Sets and Lists	68
3 Recursive Structure of Mathematical Expressions	77
3.1 Recursive Definitions and Algorithms	77
3.2 Expression Structure and Trees	84
3.3 Structure-Based Operators	108
4 Elementary Mathematical Algorithms	119
4.1 Mathematical Algorithms	119
4.2 MPL's Algorithmic Language	132
4.3 Case Study: First Order Ordinary Differential Equations	156
5 Recursive Algorithms	171
5.1 A Computational View of Recursion	171
5.2 Recursive Procedures	176
5.3 Case Study: Elementary Integration Operator	199

6 Structure of Polynomials and Rational Expressions	213
6.1 Single Variable Polynomials	214
6.2 General Polynomial Expressions	223
6.3 Relationships Between Generalized Variables	242
6.4 Manipulation of General Polynomial Expressions	247
6.5 General Rational Expressions	259
7 Exponential and Trigonometric Transformations	275
7.1 Exponential and Trigonometric Expansion	275
7.2 Exponential and Trigonometric Contraction	289
Bibliography	307
Index	317