

Contents

Introduction	1
Publications	8
1 Preliminaries	9
1.1 Basic Notation and Mathematical Prerequisites	9
1.2 Formulas and Circuits	9
1.3 Complexity Theory	12
1.3.1 Complexity classes	12
1.3.2 Reductions	18
1.3.3 Complexity results for specific problems	19
1.4 Functions and Relations	20
1.5 Constraints	28
2 Very Basic Satisfiability: The Formula Value Problem	35
2.1 Introduction	35
2.2 Logarithmic Time	36
2.3 Tools	38
2.4 Classification	39
2.4.1 General Upper Bound	39
2.4.2 Results for Individual Clones	41
2.5 Conclusion	47
3 Enumerating all Solutions For Propositional Formulas	49
3.1 Introduction	49
3.2 Preliminaries	49
3.3 Algorithms	50
3.4 Hardness Results	52
3.5 Conclusion	54
4 Constraint Satisfaction Problems in Polynomial Time	57
4.1 Introduction	57
4.2 Preliminaries and Algebraic Tools	58
4.3 Algorithms	62
4.4 The Equality Relation	64
4.5 Hardness Results	67

4.6 Conclusion	70
5 Quantified Constraints: Decision and Counting	75
5.1 Introduction	75
5.2 Counting Problems and Reductions	76
5.3 Quantified Constraint Formulas	78
5.4 Affine Constraint Languages	86
5.5 Complexity Results for Counting	88
5.6 Decision Problems	95
5.6.1 Quantified Formula Evaluation	95
5.6.2 Quantified Model Checking	97
5.6.3 The Equivalence Problem	97
5.7 Conclusion	105
Concluding Remarks	109
Lebenslauf	111
Bibliography	112
Index	119