

Contents

Preface	vii
List of Contributors	xvii
I Past, Present, and Future	1
1 Mathematics and India, P.R. Masani	3
1.1 Mathematics in Europe	3
1.2 Mathematics in India up to Ramanujan	5
1.3 Indology and Some Post-Ramanujan Development	8
1.4 Conclusion	13
1.5 References	14
II Algebraic Curves	17
2 Square-root Parametrization of Plane Curves, Shreeram S. Abhyankar	19
2.1 Introduction	19
2.2 Hyperelliptic Curves	21
2.3 Deriving the Special Polynomial	22
2.4 Singularities of the Auxiliary Curve	26
2.5 Parametrizing the Auxiliary Curve in Characteristic Seven	33
2.6 Finding the factors	49
2.7 The factorization	77
2.8 Galois groups	81
2.9 References	84
3 A Letter as an Appendix to the Square-Root Parameterization Paper Of Abhyankar, J-P. Serre	85
The Letter	85
4 Equisingularity Invariants of Plane Curves, Angel Granja	89
4.1 Introduction	89
4.2 Equiresolution Class	91
4.3 Apéry Basis Relative to a Parameter	91
4.4 Technical Lemmas	96
4.5 Inversion	100

4.6	Apery Basis and Formal Quadratic Transformations	105
4.7	Algebroid Case	110
4.8	References	111
5	Classification of Algebraic Space Curves, III, <i>Robin Hartshorne</i>	113
5.1	Introduction	113
5.2	The Classification	114
5.3	Examples	117
5.4	Open Problems	119
5.5	References	119
6	Plane Polynomial Curves, <i>Avinash Sathaye and Jon Stenerson</i>	121
6.1	Introduction	121
6.2	Preliminaries and Notation	122
6.3	Semigroups of Curves with One Place at Infinity	127
6.4	Degree Semigroups of Polynomial Curves.	134
6.5	References	141
III	Algebraic Surfaces	143
7	A Sharp Castelnuovo Bound for the Normalization of Certain Projective Surfaces, <i>Nadia Chiarli</i>	145
7.1	Introduction	145
7.2	References	151
8	Abhyankar's Work on Desingularization, <i>S.B. Mulay</i>	153
8.1	Introduction	153
8.2	Algebraic Curves	153
8.3	Algebraic Surfaces	155
8.4	References	159
9	Moduli Spaces for Special Surfaces of General Type, <i>Wolfgang K. Seiler</i>	161
9.1	Introduction	161
9.2	Deformations of Surfaces	163
9.3	Moduli Space of Surfaces	168
9.4	References	171

IV Analytic Functions	173
10 A Stationary Phase Formula for p-ADIC Integrals and its Applications, Jun-ichi Igusa	175
10.1 Introduction	175
10.2 p -adic Stationary Phase Formula	176
10.3 Orbital Structure over \mathbb{F}_q	179
10.4 Ten Partial Integrals and $Z(s)$	182
10.5 Computation of $I_1, I'_1, I_2, I'_2, I''_2, I''_4$	184
10.6 Computation of I_3	185
10.7 Computation of I'_4	186
10.8 Computation of I_4	188
10.9 Computation of I_5	191
10.10 References	194
V Groups and Coverings	195
11 The Q-admissibility of $2A_6$ and $2A_7$, Walter Feit	197
11.1 Introduction	197
11.2 Notation	198
11.3 Some Polynomials	198
11.4 The Proof of Theorem A	202
11.5 References	202
12 Groups Which Cannot be Realized as Fundamental Groups of the Complements to Hypersurfaces in C^N, Anatoly S. Libgober	203
12.1 Introduction	203
12.2 Alexander Polynomials of Plane Curves	204
12.3 References	206
13 Unramified Coverings of the Affine Line in Positive Characteristic, Madhav V. Nori	209
13.1 Introduction	209
13.2 Unramified Coverings	209
13.3 A remark on the Lang morphism	212
VI Young Tableaux	213
14 Abhyankar's Work on Young Tableaux and Some Recent Developments, Sudhir R. Ghorpade	215
14.1 Introduction	215
14.2 Preliminaries plus Preview	216
14.3 Enumeration of Standard Tableaux	219

14.4 Universal Determinantal Identity	230
14.5 Indexed Monomials	233
14.6 Determinantal Ideals and their Hilbert Functions	237
14.7 Some Recent Developments	244
14.8 References	247
15 Abhyankar's Recursive Formula Regarding Standard Bi-Tableau, <i>Shrinivas G. Udpikar</i>	251
15.1 Notation and definitions.	251
15.2 Integer Valued Functions $F_D^{(Lk)}(m, p, a)$	253
15.3 Abhyankar's Recursive formula	255
15.4 Some Results	257
15.5 References	259
16 Correspondences Between Tableaux and Monomials, <i>Sanjeevani V. Vaidya (Joshi)</i>	261
16.1 Introduction	261
16.2 Notation and Terminology	266
16.3 Generalized Rodeletive Correspondence	266
16.4 Generalized Codeletion	268
16.5 Generalized Roinsertion	270
16.6 Generalized Coinsertion	275
16.7 Applications	279
16.8 References	280
VII Commutative Algebra	283
17 Report on the Torsion of the Differential Module of an Algebraic Curve, <i>Robert W. Berger</i>	285
17.1 Introduction	285
17.2 Conditions on the Number of Generators of I	285
17.3 Exact Differentials, Maximal Torsion and Quasi Homogeneous Singularities	290
17.4 Conditions on the Embedding Dimension, The Index of Stability, and the Multiplicity	293
17.5 Conditions on the Linkage Class	296
17.6 Smoothability Conditions	298
17.7 Quadratic Transforms	299
17.8 Equisingularity	300
17.9 References	301
18 A Quick Proof of the Hartshorne–Lichtenbaum Vanishing Theorem, <i>Markus Brodmann and Craig Huneke</i>	305
18.1 Introduction	305
18.2 The Proof	305

18.3 References	307
19 Projective Lines Over One-Dimensional Semilocal Domains and Spectra of Birational Extensions, William Heinzer, David Lantz, and Sylvia Wiegand	309
19.1 Introduction	309
19.2 The Projective Line Over a One-Dimensional Semilocal Do- main	313
19.3 Spectra of Birational Extensions of the Affine Line	318
19.4 Spectra of Parameter Blowups of Two-Dimensional Local Domains	321
19.5 References	324
20 Some Questions on $Z[\sqrt{14}]$, Masayoshi Nagata	327
20.1 Introduction	327
20.2 Notation and Terminology	328
20.3 Some questions	328
20.4 Observation	329
20.5 Bases of the conjecture	330
20.6 Remark	331
20.7 References	332
21 Function Fields of Conics, a Theorem of Amitsur–MacRae, and a Problem of Zariski, Jack Ohm	333
21.1 Introduction	333
21.2 Function fields	336
21.3 The canonical defining conics	339
21.4 Splitting	344
21.5 The Amitsur–MacRae theorem	348
21.6 The Zariski problem	354
21.7 Bibliographic remarks and References	359
21.8 References	360
22 Gradings of Polynomial Rings, Peter Russell	365
22.1 Introduction	365
22.2 The Question	365
22.3 Homogeneous Maximal Ideals	367
22.4 Maximal Homogeneous Ideals	368
22.5 Some Answers	369
22.6 References	372
23 Rigid Hilbert Polynomials for m-Primary Ideals, Judith D. Sally	375
23.1 Introduction	375
23.2 Rigidity of Polynomials	377

23.3 References	379
24 One-Dimensional Local Rings with Finite Cohen–Macaulay Type, Roger Wiegand	381
24.1 Introduction	381
24.2 Necessary and Sufficient Conditions	382
24.3 Degree 3 Extensions	386
24.4 References	388
VIII Computational Algebraic Geometry	391
25 Some Applications of Constructive Real Algebraic Geometry, Chandrajit L. Bajaj	393
25.1 Introduction	393
25.2 Global Parameterization	393
25.3 Local Parameterization	395
25.4 Intersection	399
25.5 Interpolation and Approximation	402
25.6 References	403
26 An Improved Sign Determination Algorithm, John Canny	407
26.1 Introduction	407
26.2 Sign Determination	409
26.3 A Sign-Determination Algorithm	414
26.4 Conclusions	417
26.5 References	417
27 Decomposition Algorithms in Geometry, Bernard Chazelle and Leonidas Palios	419
27.1 Introduction	419
27.2 The Two-Dimensional Case	420
27.3 The Three-dimensional Case	440
27.4 Concluding Remarks	444
27.5 References	444
28 Single Exponential Path Finding in Semi-algebraic Sets, Part II: The General Case, Joos Heintz, Marie-Francoise Roy, and Pablo Solerno	449
28.1 Introduction	449
28.2 Some auxiliary results	451
28.3 Proof of the Main Theorem	454
28.4 A note about the computation of the connected components	462
28.5 References	465

29 An Improved Projection for Cylindrical Algebraic Decomposition, D. Lazard	467
29.1 Introduction	467
29.2 Working domains and basic definitions.	468
29.3 The projection set.	470
29.4 The CAD algorithm.	471
29.5 Practical improvements.	474
29.6 References	475
30 Degree Bounds of Gröbner Bases, Wei Li	477
30.1 Introduction	477
30.2 Preliminaries	479
30.3 Nonexistence of Bounds Over $\mathbf{Z}[\mathbf{x}, \mathbf{y}]$	483
30.4 Some Problems on Complexity	487
30.5 References	489
31 Elastica and Computer Vision, David Mumford	491
31.1 Introduction	491
31.2 Edges in Computer Vision	492
31.3 A Brownian Prior for Edges	495
31.4 Alternate Priors	498
31.5 The Differential Equation of Elastica	500
31.6 Solving for Elastica	501
31.7 References	505
32 Isolator Polynomials, Thomas W. Sedeberg and Geng-Zhe Chang	507
32.1 Introduction	507
32.2 Isolator Polynomials	507
32.3 Motivating Examples	508
32.4 Polynomial Remainder Sequences	510
32.5 Conclusion	511
32.6 References	511
33 A Bound on the Implicit Degree of Polygonal Bézier Surfaces, Joe Warren	513
33.1 Introduction	513
33.2 Base points	514
33.3 Intersection multiplicity and Newton polygons	516
33.4 A degree bound for polygonal patches	522
33.5 References	524
IX Publications of Shreeram S. Abhyankar	527