

CONTENTS

Preface	ix
2. Introduction	1
2.1 Classical Padé approximation	1
2.2 Toeplitz and Hankel systems	2
2.3 Continued fractions	3
2.4 Orthogonal polynomials	4
2.5 Rhombus algorithms and convergence	5
2.6 Block structure	5
2.7 Laurent-Padé approximants	6
2.8 The projection method	7
2.9 Applications	7
2.10 Outline	10
3. Moebius transforms, continued fractions and Padé approximants	11
3.1 Moebius transforms	11
3.2 Flow graphs	14
3.3 Continued fractions (CF)	18
3.4 Formal series	22
3.5 Padé approximants	24
4. Two algorithms	29
4.1 Algorithm 1	29
4.2 Algorithm 2	32
5. All kinds of Padé Approximants	37
5.1 Padé approximants	37
5.2 Laurent-Padé approximants	39
5.3 Two-point Padé approximants	43
6. Continued fractions	47
6.1 General observations	47
6.2 Some special cases	49
7. Moebius transforms	55
7.1 General observations	55
7.2 Some special cases	57
8. Rhombus algorithms	65

8.1	The ab parameters (sawtooth path)	65
8.2	The FG parameters (row path)	72
8.3	A staircase path	73
8.4	$\rho\sigma$ paramaters (diagonal path)	75
8.5	Some dual results	77
8.6	Relation with classical algorithms	81
9.	Biorthogonal polynomials, quadrature and reproducing kernels	83
9.1	Biorthogonal polynomials	83
9.2	Interpolatory quadrature methods	90
9.3	Reproducing kernels	94
9.4	Other orthogonality relations	98
10.	Determinant expressions and matrix interpretations	103
10.1	Determinant expressions	103
10.2	Matrix interpretations	112
10.2.1	Toeplitz matrices	112
10.2.2	Hankel matrices	122
10.2.3	Tridiagonal matrices	127
11.	Symmetry Properties	132
11.1	Symmetry for $F(z)$ and $\hat{F}(z) = F(1/z)$	132
11.2	Symmetry for $F(z)$ and $G(z) = 1/F(z)$	136
12.	Block structures	141
12.1	Pade forms, Laurent-Pade forms and two-point Pade forms	141
12.2	The T -table	143
12.3	The Pade, Laurent-Pade, and two-point Pade tables	149
13.	Meromorphic functions and asymptotic behaviour	155
13.1	The function $F(z)$	155
13.2	Asymptotics for finite Toeplitz determinants	156
13.3	Asymptotics for infinite Toeplitz determinants	159
13.4	Consequences for the T -table	163
14.	Montessus de Ballore theorem for Laurent-Padé approximants	167
14.1	Semi infinite Laurent series	167
14.2	Bi-infinite Laurent series	170
15.	Determination of poles	173
15.1	Rutishauser polynomials of type 1 and type 2	173
15.2	Rutishauser polynomials of type 3	179
15.3	Rutishauser polynomials and Laurent series	181

15.4	Convergence of parameters	183
16.	Determination of zeros	187
16.1	Dual Rutishauser polynomials and semi-infinite series	187
16.2	From semi-infinite to bi-infinite series	189
16.3	Convergence of parameters	193
17.	Convergence in a row of the Laurent-Padé table	195
17.1	Toeplitz operators and the projection method	197
17.2	Convergence of the denominator	199
17.3	Convergence of the numerator	203
18.	The positive definite case and applications	207
18.1	Function classes	207
18.2	Connection with the previous results	212
18.3	Stochastic processes and systems	219
18.4	Lossless inverse scattering and transmission lines	224
18.5	Laurent-Padé approximation and ARMA-filtering	230
18.6	Concluding remarks	231
19.	Examples	233
19.1	Example 1	233
19.2	Example 2	248
19.3	Example 3	253
	References	257
	List of symbols	263
	Subject index	271