Conclusion

Of course, this is not the last word in the investigation and application of the Chebyshev approach to optimization problems in polynomial spaces. For instance, there can be further development along the following lines:

1. Describe the stratification of the sphere $\{||P||_E = 1\}$ in the space (2) by smooth faces. To our knowledge, this is an unsolved problem even in the case when E is a single interval.
2. Determine integers g, k, $m_0, \dots, m_g$ corresponding to the solution of an extremum problem from the data of this problem.
3. Investigate the topology of the fibres of the period map $\Pi_{-}\colon \tilde{\mathscr{H}}_g^k \to \mathbb{R}^g$. We conjectured above that each component of a fiber is a cell.
4. Linear Poincaré theta series are poorly convergent in a neighbourhood of (a part of) the boundary of our moduli space. The question of improving the convergence arises. A more general question was put by Klein in 1923: regularize absolutely divergent theta series.
5. Develop global methods for solving equations (for instance, Abel's equations) in moduli spaces of curves. Newton's method works very well in a small neighbourhood of a solution, but its global dynamics is completely unpredictable.
6. Use other uniformizations of curves M for calculations. Fuchsian uniformization cannot be used because then linear Poincaré theta series will be divergent [149]. Another Schottky uniformization, not equivalent to the one presented here (and based on an incomplete dissection) was used in [37]; in this case Abel's equations and the parametric representation for polynomials get another form.
7. Use Riemann theta functions in the computations of the theory. The advantage of this approach is a higher convergence rate of series, particularly for large genera g. But it also has two deficiencies: (1) the Schottky problem of describing the period matrices of (hyperelliptic) Riemann surfaces in the Siegel upper half-

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space [108] must be solved numerically; (2) the image of an algebraic curve in its Jacobian under the Abel–Jacobi map must be localized numerically.

8. Construct a compactification of the moduli space $\mathcal{H}_g^k$ such that the cell decomposition of Chapter 4 becomes a cell complex.
9. Prove or disprove that the value L/n^2 for optimal stability polynomials converges for each $p = 2, 3, \ldots$. Give the value of this limit in terms of Riemann surfaces.

References

1. Abdulle, A.: On roots and error constants of optimal stability polynomials. BIT **42**, 177-182 (2000)
2. Abel, N.H.: Sur l'intégration la formule diférentielle $\frac{\rho dx}{\sqrt{R}}$, R et ρ etant des fonctions entieres. J. Reine Angew. Math. **1**, 105-144 (1826).
3. Ahlfors, L.V.: Lectures on Quasiconformal Mappings, Van Nostrand: Toronto, Ont. (1966)
4. Ahlfors, L., Bers, L: Spaces of Riemann Surfaces and Quasiconformal Mappings, Moscow, Inostrannaya Literatura (1961). (A Russian translation of several papers: Bers, L.: Quasiconformal mappings and Teichmuller's theorem. In: Analytic Functions, pp. 89–119, Princeton Univ. Press, Princeton, N.J. (1960); Ahlfors, L.: The complex analytic structure of the space of closed Riemann surfaces. Ibid., pp. 45–66; Bers, L.: Spaces of Riemann surfaces. In: Proc. Internat. Congr. Math. (Edinburgh, 1958), pp. 349–361; Bers, L.: Simultaneous uniformization. Bull. Amer. Math. Soc. **66**, 94–97 (1960); Bers, L.: Holomorphic differentials as functions of moduli. Bull. Amer. Math. Soc. **67**, 206–210 (1961); Ahlfors, L. On quasiconformal mappings. J. Anal. Math. **3** 1–58; correction, 207–208 (1954))
5. Ahlfors, L.V.: The complex analytic structure of the space of closed Riemann surfaces. In: Analytic Functions, pp. 45–66, Princeton Univ. Press, Princeton, N.J. (1960)
6. Akaza, T., Inoue, K.: Limit sets of geometrically finite free kleinian groups. Tohoku Math. J. **36** 1–16 (1984)
7. Akaza, T.: Singular sets of some Kleinian groups. Nagoya Math. J. **29**, 145-162 (1967)
8. Akaza, T., Inoue, K.: On the limit set of a geometrically finite Kleinian group Sci. Rep. Kanazawa Univ. **27**, 85-115 (1982)
9. Akhiezer, N.I.: Über einige Funktionen die in gegebenen Intervallen am wenigsten von Null abweichen. Izv. Kazan Fiz.-Mat. Obshch. textbf3, no. 3 (1928)
10. Akhiezer, N.I.: Über einige functionen welche in zwei gegebenen Intervellen am wenigsten von Null abweichen I–III. Izv. Akad. Nauk SSSR **9**, 1163–1202 (1932); **3**, 309–344 (1933); **4**, 499–536 (1933)
11. Akhiezer, N.I.: Orthogonal polynomials on several intervals. Dokl. Akad. Nauk SSSR. **134**:1, 9–12 (1960). (in Russian)
12. Akhiezer, N.I.: Lectures in the Theory of Approximation. Nauka, Moscow (1965), 2nd edn. English transl. of 1st edn.: Achieser, N.I.: Theory of Approximation. Dover Publ., New York (1992)
13. Akhiezer, N.I., Levin B.Ya.: Inequalities for derivatives similar to Bernoulli's inequality. Dokl. Akad. Nauk SSSR **117**:5, 735–738 (1957). (in Russian)
14. Antoniou, A.: Digital Filters: Analysis, Design, and Applications, McGraw-Hill (1979)
15. Arnold, V.I.: Arnold's Problems. Phasis, Moscow (2000). English transl.: Springer-Verlag, Berlin; PHASIS, Moscow (2004)

A. Bogatyrev and N. Kruzhilin, *Extremal Polynomials and Riemann Surfaces*, Springer Monographs in Mathematics, DOI 10.1007/978-3-642-25634-9,

16. Arbarello, E., Cornalba, M., Grifiths, P.A., Harris, J.: Geometry of Algebraic Curves I-II. Springer, New York 1985.
17. Artin, E.: Theorie der Zöpfe. Abh. Math. Semin. Univ. Hamburg. **4**, 47-72 (1925)
18. Baker, H.F.: Abel Theorem and Allied Theory. Cambridge (1897)
19. Belokolos, E.D., Enolskii, V.Z.: Reduction of abelian unctions and completely integrable equations. J. Math. Sci. **106** 3395–3486 (2001); **108** 295–374 (2002)
20. Bers, L. Uniformization, moduli and Kleinian groups. Bull. London Math. Soc. **4**, 257-300 (1972)
21. Birman, J.S.: Braids, Links, and Mapping Class Groups. Princeton University Press, Princeton, NJ: (1974)
22. Bobenko, A.I., Klein, Ch. (Eds.): Computational Approach to Riemann Surfaces. Lecture Notes in Mathematics, Vol. 2013, Springer (2011)
23. Bogatyrev, A.B.: Chebyshev polynomials and navigation in moduli space of hyperelliptic curves. Russian J. Numer. Anal. Math. Modelling. **14**:3, 205–220 (1999)
24. Bogatyrev, A.B.: Fibers of periods map are cells? J. Comput. Appl. Math. **153**, 647-548 (2003)
25. Bogatyrev, A.B.: Effectve computation of optimal stability polynomials. Calcolo. **41**:4, 247-156 (2004)
26. Bogatyrev. A.B.: Chebyshev representation for rational functions. Sb. Math. **201** 1579 - 1598 (2010)
27. Bogatyrev, A.B.: Computations in moduli spaces. Comp. Methods and Function Theory **7**:1 (2007)
28. Burau, W.: Über Zopfinvarianten. Abh. Math. Semin. Univ. Hamburg. **4**. 47-72 (1925)
29. Burnside, W.: On a class of authomorphic functions. Proc. London Math. Soc. **23**, 49-88 (1892)
30. Buser, P., and Seppala, M.: Computing on Riemann Surfaces. Topology and Teichmuller spaces (Katinkulta, 1995), 5-30, World Sci. Publ., River Edge, NJ, 1996
31. Bakhvalov, N. S., Zhidkov, N. P., Kobel'kov, G. M.: Numerical Methods. Moscow, Nauka (1987). (in Russian)
32. Beardon, A.F.: The Geometry of Discrete Groups. Graduate Texts in Mathematics **91**. Springer-Verlag, New York (1995)
33. Bernstein, S.N.: Extremal Properties of Polynomials. Moscow, ONTI (1937).
34. Bers, L.: Holomorphic differentials as functions of moduli. Bull. Amer. Math. Soc. **67**, 206–210 (1961).
35. Bobenko, A. I. Schottky uniformization and finite-gap integration. Dokl. Akad. Nauk SSSR **295**, 268–272 (1987). English transl. in Sov. Math., Dokl. **36**:1, 38-42 (1987) [See also Chap. 5 in: Belokolos, E. D., Bobenko, A.I., Enol'skii, V.Z., Its, A.R., Matveev, V.B.: Algebro-Geometric Approach to Nonlinear Integrable Equations. Springer, Berlin (1994)]
36. Bogatyrev, A.B.: A geometric method for solving a series of integral Poincaré-Steklov equations. Mat. Zametki **63**:3, 343–353 (1998). English transl. in Math. Notes **63**, 302-310 (1998)
37. Bogatyrev, A.B.: Effective computation of Chebyshev polynomials for several intervals. Mat. Sb. **190**:11, 15–50 (1999). English transl. in Sb. Math. **190**, 1571–1605 (1999).
38. Bogatyrev, A.B.: Manifolds of support sets of Chebyshev polynomials. Mat. Zametki **67**, 828–836 (2000). English transl. in Math. Notes **67**, 699–706 (2000)
39. Bogatyrev, A.B.: Poincare–Steklov integral equations and the Riemann monodromy problem. Funktsional. Anal. i Prilozhen. **34**:2, 9–22 (2000). English transl. in Funct. Anal. Appl. **34**, 86-97 (2000)
40. Bogatyrev, A.B.: Effective approach to least deviation problems. Mat. Sb. **193**:12, 21–41 (2002). English transl. in Sb. Math. **193**, 1749–1769 (2002)
41. Bogatyrev, A.B.: Representation of moduli spaces of curves and the computation of extremal polynomials. Mat. Sb. **194**:4, 3–28 (2003). English transl. in Sb. Math. **194**, 469–494 (2003)
42. Bogatyrev, A.B.: A combinatorial description of a moduli space of curves and of extremal polynomials. Mat. Sb. **194**:10, 27–48 (2003). English transl. in Sb. Math. **194**, 1451–1473 (2003).

43. Bogatyrev, A.B.: Effective solution of the problem of the optimal stability polynomial. Mat. Sb. **196**:7, 27–50 (2005). English transl. in Sb. Math. **196**, 959–981 (2005)
44. Cauer, W.: Ein Interpolationsproblem mit Functionen mit positivem Realteil. Math. Z. **38** (1934)
45. Cauer, W.: Theorie der Linearen Wechselstromschaltungen. Akademie Verlag, Berlin (1954)
46. Chebotarev, N.G.: The Theory of Algebraic Functions. OGIZ, Moscow-Leningrad (1948). (in Russian)
47. Chebyshev, P.L.: Théorie des mécanismes connus sous le nom de parallélogrammes. Mém. Acad. Sci. Pétersb. **7**, 539-568 (1854).
48. Chekhov, L.O.: Matrix models: Geometry of moduli spaces and exact solutions. Teoret. Mat. Fiz. **127**, 179-252 (2001). English transl. in Theor. Math. Phys. **127**, 557-618 (2001)
49. Chen, X., Parks, T.W.: Analytic design of optimal FIR narrow-band filters using Zolotarev polynomials. IEEE Trans. on Circuits and Systems. **33**, 1065-1071 (1986)
50. Crowdy, D.G., Marshall, J.S.: Conformal mappings between canonical multiply connected domains. Computational Methods and Function Theory, **6** 59-76 (2006)
51. Crowdy, D.G.: Schwarz–Christoffel mappings to unbounded multiply connected polygonal regions. Math. Proc. Cambridge Philos. Soc., **142** 319–339 (2007)
52. Crowdy, D.G., Marshall, J.S.: Green's functions for Laplace's equation in multiply connected domains. IMA. J. Appl. Math., **72** 278–301 (2007)
53. Deconinck, B., van Hoeij, M.: Computing Riemann matrices of algebraic curves. Physica D **152** 28-46 (2001)
54. Deconinck, B., Heil, M., Bobenko, A., van Hoeij, M., Schmies, M.: Computing Riemann theta functions. Math. Comp. **73** 1417-1442 (2004)
55. Deconinck, B., Patterson, M.: Computing the Abel map. Physica D **237** 3214-3232 (2008)
56. Dubrovin, B.A.: Theta functions and non-linear equations. Uspekhi Mat. Nauk **36**:2, 11–80 (1981). English transl. in Russian Math. Surveys **36**:2, 11–92 (1981)
57. Earl, C.J.: On variation of projective structures. In: Riemann Surfaces and Related Topics, pp. 87-99. Princeton University Press, Princeton, NJ (1980)
58. Encyclopaedia of Mathematics. Sovetskaya Entsiklopediya, Moscow (1984). English transl. Vols. 1-5, Kluwer, Dordrecht (1988-1994)
59. Enol'skii, V.Z., Kostov, N.A.: On the geometry of elliptic solitons. Acta Appl. Math. **36**, 57-86 (1994)
60. Farkas, H., Kra, I.: Riemann Surfaces. Springer, New York (1992)
61. Fay, J.: Theta Functions on Riemann Surfaces. Lecture Notes in Mathematics, Vol. 352. Springer, Berlin-New York (1973)
62. Fock, V.V., Dual Teichmüller spaces. ArXiv: dg-ga/9702018, 1998.
63. Fomenko, A.T., Fuchs, D.B.: A Course of Homotopic Topology. Nauka, Moscow (1989). (in Russian)
64. Ford, L.R.: Automorphic Functions. McGraw-Hill, New York (1929)
65. Franklin, J.N.: Numerical stability in digital and analog computation for diffusion problems. J. Math. Phys. **37**, 305–315 (1959)
66. Gardiner, F.P.: Teichmüller Theory and Quadratic Differentials. Wiley, New York (1987)
67. Gesztesy, F., Weikard. R.: Picard potentials and Hill's equation on a torus. Acta Math. **176**, 73–107 (1996)
68. Gesztesy, F., Weikard. R.: Elliptic algebro-geometric solutions of the KdV and AKNS hierarchies—an analitic approach. Bull. Amer. Math. Soc. **35** 271-317 (1998)
69. Griffiths, Ph., Harris, J.: Principles of Algebraic Geometry. Wiley, New York (1994)
70. Gunning, R.C.: Lectures on Riemann Surfaces. Princeton University Press, Princeton, NJ (1966)
71. Hairer, E., Wanner, G. Solving Ordinary Differential Equations. II. Stiff and Differential-Algebraic Problems. Springer-Verlag, Berlin (1996)
72. Hejhal, D.A.: Sur les parameters accessoires pour l'uniformization de Schottky. C. R. Acad. Sci. Paris Sér. A. **279**, 713-716 (1974)
73. Hejhal, D.A.: On Schottky and Teichmüller spaces. Adv. Math. **15** 133-156 (1975)

74. Hejhal, D.A.: The variational theory of linearly polymorphic functions. J. Anal. Math. **30**, 215-264 (1976)
75. van Hoeij, M.: An algorithm for computing the Weierstrass normal form. ISSAC '95 Proceedings, 90-95 (1995).
76. van Hoeij, M.: Computing parametrizations of rational algebraic curves. ISSAC '94 Proceedings, 187-190 (1994)
77. van der Houwen, P.J., Kok, J.: Numerical solution of a maximal problem. Report 124/71 TW, Mathematical Centre, Amsterdam (1971)
78. Hurwitz, A.: Über Riemannsche Flächen mit gegebenen Verzweigungspunkten. Math. Ann. **39**, 1–61 (1891)
79. Hurwitz, A.: Vorlesungen über Allgemeine Funktionentheorie und Elliptische Funktione. Herausgegeben und erganzt durch einen Abschnitt uber geometrische Funktionentheorie von R. Courant. Springer-Verlag, Berlin-New York (1964)
80. Hubbard, J.H.: On monodromy of projective structures. In: Riemann Surfaces and Related Topics, pp. 257–275. Princeton University Press, Princeton, NJ (1980)
81. Hubbard, J., Masur, H.: Quadratic differentials and foliations. Acta Math. **142**:1 (1979), 221–274.
82. Igusa, J.: Problems on Abelian functions at the time of Poincare and some at present. Bull. Amer. Math. Soc., **6** 161-174 (1982)
83. Klein, F.: Vorlesungen über die Entwicklung der Mathematik im 19. Jahrhundert. I. J.Springer, Berlin (1926)
84. Kontsevich, M.L.: Intersection theory on the moduli space of curves. Funktsional. Anal. i Prilozhen. **25**:2, 50–57 (1991). English transl. in Funct. Anal. Appl. **25**:2, 123–129 (1991)
85. Kra, I.: Automorphic Forms and Kleinian Groups. Mathematics Lecture Note Series., W. A. Benjamin, Inc., Reading, Mass. (1972)
86. Kreĭn, M.G, Levin, B.Ya., Nudel'man, A.A.: On special representations of polynomials that are positive on a system of closed intervals, and some applications. In: Functional Analysis, Optimization, and Mathematical Economics, pp. 56–114, Univ. Press, New York, Oxford (1990)
87. Kreĭnes, E.M.: Rational Functions with Few Critical Values. Ph.D. Thesis, Moscow State University (2001). (in Russian).
88. Krichever, I.M.: Integration of nonlinear equations by the methods of algebraic geometry. Funktsional. Anal. i Prilozhen. **11**:2, 15–32 (1977). English transl. in Funct. Anal. Appl. **11**:2, 12–26 (1977)
89. Krushkal', S.L., Apanasov, B.N., Gusevskii, N.A.: Kleinian Groups and Uniformization in Examples and Problems. Nauka, Novosibirsk (1981). English transl. American Mathematical Society, Providence, RI (1986).
90. Lando, S.K., Ramified coverings of the two-dimensional sphere and intersection theory in spaces of meromorphic functions on algebraic curves. Uspekhi. Mat. Nauk. **57**:3, 29–98 (2002). English transl. in Russian Math. Surveys **57**, 463–533 (2002)
91. Lando, S.K., Zvonkin, A.K.: Graphs on Surfaces and their Applications. Encyclopaedia of Mathematical Sciences, Vol. 141. Berlin: Springer, New York-Berlin (2004)
92. Lavrent'ev, M.A., Shabat, B.V.: Methods of the Theory of Functions of a Complex Variable. Nauka, Moscow (1965). (in Russian)
93. Lebedev, V.I.: How rigid systems of differential equations can be solved by explicit methods. In: Marchuk, G.I. (Ed.) Vychisltel'nye Protsessy i Sistemy, Vol 8, pp. 237–292. Nauka, Moscow (1991). (in Russian)
94. Lebedev, V.I., Medovikov, A.A.: An explicit method of the second order of accuracy for solving stiff systems of ordinary differential equations. Izv. Vyssh. Uchebn. Zaved. Mat. **10**:9, 37–52 (1995). English transl. in Russ. Math. **42**:9, 52-60 (1998)
95. Lebedev, V.I.: A new method for determining the roots of polynomials of least deviation on a segment with weight and subject to additional conditions I, II. Russian J. Numer. Anal. Math. Modelling. **8**:3, 195-222; **8**:5, 397-426 (1993)

96. Lebedev, V.I.: Zolotarev polynomials and extremum problems Russian J. Numer. Anal. Math. Modelling. **9**:3, 231-263 (1994)
97. Lebedev, V.I.: Extremal polynomials with restrictions and optimal algorithms. In: Advanced Mathematics: Computation and Applications (Eds. Alekseev, A.S., Bakhvalov, N.S.), pp. 491-502. NCC Publishers, Novosibirsk (1995)
98. Lomax, H.: On the construction of highly stable, explicit numerical methods for integrating coupled ordinary differential equations with parasitic eigenvalues. NASA Technical Note, NASATND/4547 (1968)
99. Malyshev, V.A.: The Abel equation. Algebra i Analiz, **13**:6, 1–55 (2001). English transl. in St. Petersburg Math. J. **13**, 893-938 (2002).
100. Markov, A.A.: Lectures on functions deviating least from zero. In: Markov, A.A.: Selected Papers on Continued Fractions and Functions Least Deviating from Zero. Gostekhizdat, Mosow-Leningrad (1948). (in Russian)
101. Markov, A.A.: A question put by D.I.Mendeleev. Izv. Pererburg. Akad. Nauk, issue 62, 1-24 (1889). (in Russian)
102. Markov V.A.: Functions Deviating Least from Zero on a Prescribed Interval. St.-Petersburg (1892). (in Russian)
103. Medovikov, A.A.: High order explicit methods for parabolic equations. BIT **38**, 372-390 (1998)
104. Meiman, N.N.: On the theory of polynomials deviating least from zero. Dokl. Akad. Nauk SSSR **130**:2, 257-260 (1960). English transl. in Sov. Math., Dokl. **1**, 41-44 (1960)
105. Metzger, C.: Métodes de Runge–Kutta de Rang Superieur á l’Ordre. Thesis, Univ. Grenoble (1967)
106. Mityushev, V.V.: Convergence of the Poincaré series for the classical Schottky groups. Proc. Amer. Math. Soc., **126**, 2399-2406 (1998)
107. Mumford, D.: Curves and Their Jacobians. University of Michigan Press, Ann Arbor (1975)
108. Mumford, D.: Tata Lectures on Theta, I. Birkhäuser, Boston-Basel (1983)
109. Mumford, D., Series, C., Wright, D.: Indra’s Pearls: The Vision of Felix Klein, Cambridge University Press (2002), 416 p.
110. Myrberg, P.J.: Zur Theorie der Convergenz der Poincareschen Reihen. Ann. Acad. Sci. Fenn. (A). **9**:4, 1–75 (1916)
111. Natanzon, S.M.: Moduli of Riemann Surfaces, Real Algebraic Curves, and Their Superanalogs. Moscow Centre for Continued Mathematical Education, Moscow (2003). English transl. American Mathematical Society, Providence, RI (2004)
112. Pakovich, F.B.: Elliptic polynomials. Uspekhi Mat. Nauk **50**:6, 203-204. English transl. in Russian Math. Surveys **50**, 1292-1294 (1995)
113. Pakovitch, F.: Combinatoire des arbes planaires et arithmétique des courbes hyperelliptiques Ann. Inst. Fourier, **48**, 323-351 (1998)
114. Paszkowski, S.: Numerical Applications of Chebyshev Polynomials and Series. Panstwowe Wydawnictwo Naukowe, Warszawa (1983) (in Polish)
115. Peherstorfer, F.: On Bernstein-Szegö orthogonal polynomials on several intervals. II. Orthogonal polynomials with periodic recurrence coefficients. J. Approx. Theory. **64**, 123-161 (1991)
116. Peherstorfer, F.: Orthogonal and extremal polynomials on several intervals. J. Comput. Appl. Math. **48**, 187-205 (1993)
117. Peherstorfer, F.: Deformation of minimal polynomials and approximation of several intervals by an inverse polynomial mapping. J. Approx. Theory. **111**, 180-195 (2001)
118. Peherstorfer, F., Schiefermayr, K.: Description of extremal polynomials on several intervals and their computation I, II. Acta Math. Hungar. **83**, 71-102, 103-128 (1999)
119. Poincaré, H.: Sur la réduction des intégrales Abéliennes. Bull. Soc. Math. France, **12** 124-143 (1884)
120. Poincaré, A.: Théorie des groupes fuchsiennes Acta Math. **1**, 1-62 (1882)
121. Poincaré, A.: Sur les fonctions fuchsiennes. Acta Math. **1**, 193-294 (1882)

122. Poincaré, A.: Analyse des travaux scientifiques de Henri Poincaré faite par lui-même. Acta Math. **38**, 36-135 (1921)
123. Prasolov, V.V., Schwartsman, O.V.: Alphabeth of Riemann Surfaces, Phasis: Moscow (1999). (in Russian)
124. Rauch, H.E.: Weierstrass points, branch points, and moduli of Riemann surfaces. Comm. Pure Appl. Math. **12** 543-560, (1959)
125. Rauch, H.E.: On the transcendential moduli of algebraic Riemann surfaces. Proc. Nat. Acad. Sci. USA. **41**, 42-49 (1955)
126. Remez, Ya.I.: General Numerical Methods of Chebyshev Approximation. Publishing House of the Academy of Sciences of Ukr.SSR, Kiev (1957). (in Russian)
127. Riha, W.: Optimal stability polynomials. Computing. **9**, 37-43 (1972)
128. Robinson, R.: Conjugate algebraic integers in real point sets. Math. Z. **84**, 415-427 (1964)
129. Rockafellar, R.T.: Convex Analysis. Princeton University Press, Princeton, NJ (1970)
130. Schiffer, M., Spencer, D.C.: Functionals of finite Riemann surfaces. Princeton University Press, Princeton, NJ (1954)
131. Schmies, M.: Computational Methods for Riemann Surfaces and Helicoids with Handles. PhD thesis, TU Berlin (2005)
132. Schottky, F.: Über eine specielle Function welche bei einer bestimmten linearen Transformation unverändert bleibt. J. Reine Angew. Math. **101**, 227-272 (1887)
133. Seppala, M.: Computational methods in the theory of Riemann surfaces and algebraic curves. Proceedings of Workshop on Symbolic and Numeric Computation, (Helsinki, May 30–31, 1991). Computing Centre, University of Helsinki, Research Reports N. **17** 145-150 (1991)
134. Seppala, M.: Computation of period matrices of real algebraic curves. Discrete Comput. Geom. **11** 65-81 (1994)
135. Shabat, B.V.: Introduction to Complex Analysis. Part II. Nauka, Moscow (1985). English transl. American Mathematical Society, Providence, RI, 1992
136. Shabat, G.B., Zvonkin, A.K.: Plane trees and algebraic numbers. Contemp. Math. **178**, 233-275 (1994)
137. Shafarevich, I.R.: Basic Algebraic Geometry, 1-2. Nauka, Moscow (1988). English transl. Springer-Verlag, Berlin (1994)
138. Singer, I.: Best Approximation in Normed Vector Spaces by Elements from Subspaces. Acad. RSR, Bucuresti (1967). (in Romanian)
139. Sodin, M.L., Yuditskii, P.M.: Functions deviating least from zero on closed subsets of the real axis. Algebra i Analiz **4**:2, 1–61 (1992). English transl. in St. Petersburg Math. J. **4**, 201-249 (1993)
140. Sodin, M.L., Yuditskii, P.M.: Algebraic solution of a problem of E. I. Zolotarev and N. I. Akhiezer on polynomials with smallest deviation from zero. Teor. Funkts., Funkts. Anal. Prilozh. 56, 56-64 (1991). English transl. in J. Math. Sci. (New York) **76**, No.4, 2486-2492 (1995)
141. Springer, G.: Introduction to Riemann Surfaces. Addison-Wesley, Reading, Mass. (1957)
142. Stetter, H.J.: Analysis of Discretization Methods for Ordinary Differential Equations. Springer-Verlag, New York-Heidelberg (1973)
143. Strebel, K.: Quadratic Differentials. Springer, Berlin-New York (1984)
144. Suetin, S.P.: Pade approximants and the effective analytic continuation of a power series. Uspekhi Mat. Nauk **57**:1, 45-142 (2002). English transl. in Russian Math, Surveys **57**, 43-141 (2002)
145. Sullivan, D.: Entropy, Hausdorff measures old and new, and limit sets of geometrically finite Kleinian groups. Acta Math., **153**, 259-277 (1984)
146. Tikhomirov, V.M.: Some Problems of Approximation Theory, Moscow State University Publishing House, Moscow (1976). (in Russian)
147. Todd, J.: A legacy from Zolotarev. Math Intelligencer. **10**:2, 50-53 (1988)
148. Totik, V.: Polynomial inverse images and polynomial inequalities. Acta Math. **187**, 139-160 (2001)
149. Tsuji, M.: Potential Theory in Modern Function Theory. Maruzen, Tokyo (1959)

150. Vassiliev, V.A.: Ramified Integrals. Moscow Centre for Continued Mathematical Education, Moscow (2000). English version: Vassiliev, V. A.: Ramified Integrals, Singularities and Lacunas. Mathematics and its Applications, **315**, Kluwer, Dordrecht (1995)
151. Vassiliev, V.A.: Introduction to Topology, Phasis, Moscow (1977). English transl. American Mathematical Society, Providence, RI, (2001)
152. Vekua, I.N.: Generalized Analytic Functions. Nauka, Moscow (1988), 2nd edn. English transl. of 1st edn. Pergamon Press, London-Paris-Frankfurt; Addison-Wesley, Reading, Mass. (1962)
153. Verwer, J.W.: Explicit Runge–Kutta methods for parabolic partial differential equations. Appl. Numer. Math. **22**, 359-379 (1996)
154. Vlček, M., Unbehauen, R.: Zolotarev Polynomials and optimal FIR filters. IEEE Trans. on Signal Processing. **47**, 717-729 (1999)
155. Whittaker, E.T., Watson, G.N.: A Course of Modern Analysis. Cambridge University Press, New York (1962)
156. Widom, H.: Extremal polynomials associated with a system of curves in the complex plane. Adv. Math. **3** 127-232 (1969)
157. Zakharov, V.E., Zaslavskii, M.M., Kabatchenko, I.M., Matushevskii, G.V., Polnikov, V.G.: Conceptually new wind-wave model. In: The Wind-Driven Air-Sea Interface (Ed. Banner, M.L.), pp. 159-164. The University of New South Wales, Sydney, Australia (1999)
158. Zdravkovska, S.: Topological classification of polynomial maps. Uspekhi Mat. Nauk **25**:4, 179–180 (1970). (in Russian)
159. Zieschang, H., Vogt, E., Coldewey, H.-D.: Flachen und Ebene Diskontinuierliche Gruppen. Lecture Notes in Mathematics, Vol. 122, Springer-Verlag, Berlin-New York (1970)
160. Zolotarëv, E.I.: A question on least quantities (1868). In: Zolotarëv, E.I.: Selected Papers, Vol. 2, pp. 130–166, USSR Academy of Sciences, Leningrad (1932). (in Russian)
161. Zolotarëv, E.I.: The theory of integral complex numbers with applications to integration (D.Sc. Thesis, 1874). In: Zolotarëv, E.I.: Selected Papers, Vol. 1, pp.161–360, USSR Academy of Sciences, Leningrad (1932). (in Russian)
162. Zolotarëv, E.I.: Applications of elliptic functions to questions of functions deviating least and greatest from zero (1877). In: Zolotarëv, E.I.: Selected Papers, Vol. 2, pp. 1–59, USSR Academy of Sciences, Leningrad (1932). (in Russian)
163. Zvonkine, D.A., Lando, S.K.: On multiplicities of the Lyashko-Looijenga mapping on discriminant strata. Funktsonal. Anal. i Prilozhen. **33**:3, 21–34 (1999). English transl. in Funct. Anal. Appl. **33**:3, 178–188 (1999)

Further Reading

1. Bogatyrev, A.B.: Extremal polynomials and algebraic curves (a survey). In: Advances in Constructive Approximations (Eds. Saff, E., Neamtu, M.), pp. 109–122. Nashboro Press, Brentwood (2004)
2. Chebyshev, P.L.: Selected Works. OGIZ, Moscow-Leningrad (1946). (in Russian)
3. Chern, S.S.: Complex Manifods. Instituto de Fisica e Matematica, Universidade do Recife (1959)
4. Dubrovin, B.A., Novikov, S.P., Fomenko, A.T.: Modern Geometry. Nauka, Moscow (1986). English transl., Vols. 1–3, Springer-Verlag, New York (1984–1990)
5. Fricke, R., Klein, F.: Vorlesungen über die Theorie der Automorphen Functionen. Teubner, Leipzig (1926)
6. Hejhal, D.A.: Monodromy groups and Poincaré series Bull. Amer. Math. Soc. **84**, 339–376 (1978)
7. Kowalewski, S.: Üeber die Reduction einer bestimmten Klasse Abel'schen Integralen 3-en Ranges auf elliptische integrallen. Acta Math., **4**, 393–414 (1884)
8. Laurent, P.-J.: Approximation et Optimisation. Hermann, Paris (1972)
9. Lebedev, V.I.: Iterative methods for solving operator equations with a spectrum contained in several intervals. Zh. Vychisl. Mat. Mat. Fiz. **9**, 1247–1252 (1969). English transl. in U.S.S.R. Comput. Math. Math. Phys. **9**, 17–24 (1972)
10. Magnus, W.: Braids and Riemann surfaces. Comm. Pure Appl. Math. **25**, 151–161 (1972)
11. Nuttal, J.: Sets of minimum capacity, Padé approximants and the bubble problem. In: Bifurcation Phenomena in Mathematical Physics and Related Topics (Eds. Bardos, C., Bessis, D.), pp. 185–201, D.Reidel Publ. Company (1980)

A. Bogatyrev and N. Kruzhilin, *Extremal Polynomials and Riemann Surfaces*, Springer Monographs in Mathematics, DOI 10.1007/978-3-642-25634-9,

12. Schiffer, M., Hawley, N.S.: Connections and conformal mappings. Acta Math. **107**, 175–274 (1962)
13. Schiffer, M., Hawley, N.S.: Half order differentials on Riemann surfaces. Acta Math. **115**, 199–236 (1966)
14. Timan, A.F.: Theory of Approximation of Functions of a Real Variable. Fizmatgiz, Moscow (1960). English transl. Macmillan, New York (1963)

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A. Bogatyrev and N. Kruzhilin, *Extremal Polynomials and Riemann Surfaces*,
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