

*Projection-Iterative Methods  
for Solution of  
Operator Equations*

*by*

**N. S. Kurpel'**

Volume Forty-six  
Translations of Mathematical Monographs

*Translations*  
*of*  
*Mathematical Monographs*

Volume 46

**Projection-Iterative Methods  
for Solution of  
Operator Equations**

**by**

**N. S. Kurpel'**

**American Mathematical Society**

**Providence, Rhode Island**

**1976**

ПРОЕКЦИОННО-ИТЕРАТИВНЫЕ МЕТОДЫ  
РЕШЕНИЯ ОПЕРАТОРНЫХ УРАВНЕНИЙ

Н. С. КУРПЕЛЬ

Издательство "Наукова Думка"  
Киев-1968

Translated from the Russian by  
Israel Program for Scientific Translations

Translation edited by R. G. Douglas

*AMS (MOS) subject classifications (1970). Primary 47A50, 47H15;  
Secondary 65J05, 65H10, 65R05, 34C15, 73K15.*

**Abstract.** In this monograph general approximation methods for solving linear and nonlinear operator equations are studied, combining the ideas of projection as well as iterative methods and effecting further generalizations of the method of averaging functional corrections. Part of the book is devoted to the application of these methods to various special classes of operator equations.

**Library of Congress Cataloging in Publication Data**

**CIP**

Kurpel', Nikolai Stepanovich.

Projection-iterative methods for solution of operator equations.

(Translations of mathematical monographs ; v. 46)

Translation of Proektsionno-iterativnye metody resheniia operatornykh uravnenii.

Bibliography: p.

1. Operator equations. 2. Iterative methods

(Mathematics) I. Title. II. Series.

QA329.K8713 515'.72 76-17114

ISBN 0-8218-1596-2

## TABLE OF CONTENTS

Preface.....	1
Introduction.....	3
Chapter I. General theory of iterative projection methods for operator equations in abstract metric and normed spaces.....	13
1. Auxiliary material from the theory of semiordered spaces.....	13
2. General error estimates for approximate solutions of operator equations.....	20
3. Nonstationary iterative method for equations in abstract metric and normed spaces.....	24
4. Nonstationary generalized iterative method for equations in a space $R$ metrized by elements of a set $G$ .....	27
5. Stationary generalized iterative method for equations in a space $R$ metrized by elements of a set $G$ .....	31
6. Nonstationary generalized iterative method for equations in lattice-normed spaces.....	42
7. Some special cases of the generalized iterative method.....	47
8. Investigation of the stationary generalized iterative method for equations in lattice-normed spaces.....	51
9. Generalized algorithms for the method of averaged functional corrections.....	55
10. A special case of operator equations and projection operators.....	64
11. Modified generalized iterative method for operator equations in lattice-normed spaces.....	69
12. Modified iterative projection method in some special cases.....	75
13. Special case of the generalized iterative method for solution of certain types of operator equation.....	84
Chapter II. Investigation of iterative projection methods for solution of operator equations in Banach spaces.....	87
14. Generalized iterative projection method in Banach spaces—general case.....	87
15. Modified generalized iterative projection method in a Banach space—general case.....	92
16. Hilbert space and orthogonal projections. Error estimate for projection method.....	94
17. Investigation of generalized iterative projection methods for operator equations in Hilbert space.....	98

CONTENTS

18. Investigation of modified generalized iterative projection method for operator equations in Hilbert space.....	107
19. Iterative projection method based on minimization of the norm of the residual.....	110
20. Iterative projection method based on minimization of the norm of the error.....	114
21. Solution of some types of operator equation in a semiordered Hilbert space.....	118
22. Direct-product Banach spaces with $m$ -norm and projections $P_N$ . Error estimates for the projection method.....	121
23. Generalized iterative projection method for operator equations in an $m$ -normed direct-product Banach space with projection operator $P_N$ .....	124
24. Modified iterative projection method for operator equations in an $m$ -normed direct-product Banach space with projection operator $P_N$	126
25. $m$ -normed direct-product Banach space and projection $R$ . Error estimate for projection method.....	128
26. Investigation of generalized iterative projection methods for equations in an $m$ -normed direct-product Banach space with projection $R$ .....	130
27. Case of $k$ -normed direct-product Banach space with projection $R$ . Error estimate for projection method.....	134
28. Investigation of generalized iterative projection methods for operator equations in a $k$ -normed space with projection operator $R$ .....	136
29. Case of $l$ -normed direct-product Banach space with projection $P_N$ . Investigation of iterative projection methods.....	139
Chapter III. Application of iterative projection methods to some special classes of operator equations.....	142
30. Finite and infinite systems of algebraic and transcendental equations.....	142
31. Integral equations.....	150
32. Finite and infinite systems of integral equations.....	163
33. Forced oscillations of finite amplitude.....	173
34. Boundary-value problem of the theory of thermal explosion.....	176
35. Systems of nonlinear integral equations of the theory of shallow shells of revolution.....	180
Bibliography.....	183

## BIBLIOGRAPHY

1. R. F. Albrecht and G. Karrer, *Fixpunktsätze in uniformen Räumen*, Math. Z. 74 (1960), 387–391. MR 23 #A1359.
2. M. Altman, *On the approximate solution of non-linear functional equations*, Bull. Acad. Polon. Sci. Cl. III 5 (1957), 457–460. MR 19, 984.
3. ———, *Concerning approximate solutions of non-linear functional equations*, Bull. Acad. Polon. Sci. Cl. III 5 (1957), 461–465. MR 19, 984.
4. I. S. Anisimov, *Stationary temperature distribution in the presence of a chemical reaction*, Dokl. Akad. Nauk BSSR 5 (1961), 380–382. (Russian)
5. P. M. Anselone and R. H. Moore, *Approximate solutions of integral and operator equations*, J. Math. Anal. Appl. 9 (1964), 268–277. MR 32 #1920.
6. A. B. Bakušinskii, *A method for the numerical solution of integral equations*, Comput. Methods and Programming (Comput. Center Moscow Univ. Collect. Works III), Izdat. Moskov. Univ., Moscow, 1965, pp. 536–543. (Russian) MR 33 #1985.
7. A. N. Baluev, *On a method of Čaplygin*, Vestnik Leningrad. Univ. 11 (1956), no. 13, 27–42. (Russian) MR 18, 321.
8. Stefan Banach, *Sur les opérations dans les ensembles abstraits et leur application aux équations intégrales*, Fund. Math. 3 (1922), 133–181.
9. K. B. Barataliev, *The approximate solution of integro-differential equations with deviating argument*, Proc. Third Siberian Conf. Math. Mech. (1964), Izdat. Tomsk. Univ., Tomsk, 1964, pp. 248–250. (Russian) MR 37 #5661.
10. ———, *Application of Ju. D. Sokolov's method to the solution of integral equations with deviating argument*, Trudy Frunze Politehn. Inst. Vyp. 21 (1965), 59–69. (Russian) RŽMat. 1966 #11B283.
11. ———, *Approximate solution of two-dimensional linear integral equations with deviating argument by Ju. D. Sokolov's method*, Materials Thirteenth Sci. Conf. Professors and Instructors Phys.-Math. Faculty (Math. Section), "Mektep", Frunze, 1965, pp. 16–18. (Russian) RŽMat. 1966 #9B350.
12. ———, *The approximate solution of integro-differential equations with deviating argument*, Studies in Integro-Differential Equations in Kirghizia, no. 3, "Ilim", Frunze, 1965, pp. 69–83. (Russian) MR 37 #5662.
13. ———, *Approximate solution of some problems for integro-differential equations with retarded argument*, Candidate's Dissertation, Akad. Nauk Kirgiz. SSR, Frunze, 1965. (Russian)
14. B. A. Bel'tjukov, *Construction of rapidly converging iterative algorithms for the solution of integral equations*, Sibirsk. Mat. Ž. 6 (1965), 1415–1419. (Russian) MR 33 #4625.
15. I. S. Berezin and N. P. Židkov, *Computing methods*. Vol. 2, Fizmatgiz, Moscow, 1959; English transl., Addison-Wesley, Reading, Mass.; Pergamon Press, New York, 1966. MR 30 #4372; 31 #1756.

16. A. A. Berezovskii, *Nonlinear integral equations of sloping shells of revolution*, Inž. Ž. 1 (1961), no. 4, 107–114. (Russian)
17. G. D. Birkhoff, *Lattice theory*, 3rd ed., Amer. Math. Soc. Colloq. Publ., vol. 25, Amer. Math. Soc., Providence, R.I., 1967. MR 37 #2638.
18. L. P. Bogdanova, *On the approximate solution of a class of nonlinear integral equations with constant limits*, Proc. Sci. Conf. Engrs., Aspirants and Junior Assistants Inst. Math. Sci. Ukrain. SSR, Izdat. Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1963, pp. 63–72. (Russian)
19. P. S. Bondarenko, *Study of numerical algorithms for the approximate integration of differential equations by the method of finite differences*, Vidav. Kiiv. Univ., Kiev, 1962. (Ukrainian)
20. F. E. Browder, *Fixed point theorems for nonlinear semi-contractive mappings in Banach spaces*, Arch. Rational Mech. Anal. 21 (1966), 259–269. MR 34 #641.
21. F. E. Browder and W. V. Petryshyn, *The solution by iteration of linear functional equations in Banach spaces*, Bull. Amer. Math. Soc. 72 (1966), 566–570. MR 32 #8155a.
22. ———, *The solution by iteration of nonlinear functional equations in Banach spaces*, Bull. Amer. Math. Soc. 72 (1966), 571–575. MR 32 #8155b.
23. R. Caccioppoli, *Sugli elementi uniti delle trasformazioni funzionali: un'osservazione sui problemi di valori ai limiti*, Atti Reale Accad. Naz. Lincei (6) 13 (1931), 498–502.
24. P. Ī. Čalenko, *Estimation of the error in the method of strips for the approximate solution of integral equations*, Visnik Kiiv. Univ. 1962, no. 5, Ser. Mat. Meh. vyp. 2, 70–78. (Ukrainian) MR 34 #5330.
25. ———, *Solution of integral equations by the method of strips*, Candidate's Dissertation, Kiev. State Univ., Kiev, 1963. (Russian)
26. ———, *Finding the eigenfunctions of Fredholm integral equations of the second kind*, Visnik Kiiv. Univ. 1964, no. 6, 95–101. (Ukrainian) MR 32 #8076.
27. ———, *On the error of the method of strips in the application of numerical integration formulas*, Vyčisl. Mat. (Kiev) Vyp. 1 (1965), 79–89. (Russian) MR 34 #8641.
28. S. A. Čaplygin, *A new method for approximate integration of differential equations*, GITTL, Moscow, 1950. (Russian)
29. E. A. Černyšenko, *Investigation of convergence and establishment of an estimate of the error of the method of averaging in a complete normed space*, Ukrain. Mat. Ž. 6 (1954), 305–313. (Russian) MR 17, 665.
30. ———, *The method of averaging applied to the determination of eigenvalues of an operator equation*, Dopovīd' Akad. Nauk Ukraїn. RSR 1955, 217–221. (Ukrainian) MR 17, 665.
31. ———, *On some methods of approximate solution of operator equations*, Candidate's Dissertation, Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1955. (Russian) RŽMat. 1956 #4667.
32. ———, *On a variant of the method of averaging*, Dopovīd' Akad. Nauk Ukraїn. RSR 1956, 10–12. (Ukrainian) MR 17, 901.
33. ———, *On a method of approximate solution of Cauchy's problem for ordinary differential equations*, Ukrain. Mat. Ž. 10 (1958), no. 1, 89–100. (Russian) MR 20 #4919.
34. ———, *On the approximate solution of a boundary-value problem for the heat equation*, Naučn. Soobšč. Dnepropetrovsk. Inž.-Stroit. Inst., Vyp. 41 (1959). (Russian) RŽMat. 1960 #11726.

35. L. Cesari, *Functional analysis and Galerkin's method*, Michigan Math. J. 11 (1964) 385–414. MR 30 #4047.
36. L. Collatz, *Einige Anwendungen funktionalanalytischer Methoden in der praktischen Analysis*, Z. Angew. Math. Physik 4 (1953), 327–357. MR 15, 559.
37. ———, *Funktionalanalysis und numerische Mathematik*, Die Grundlehren der math. Wissenschaften, Band 120, Springer-Verlag, Berlin, 1964; English transl., Academic Press, New York, 1966. MR 29 #2931; 34 #4961.
38. ———, *Einige abstrakte Begriffe in der numerischen Mathematik (Anwendungen der Halbordnung)*, Computing (Arch Elektron. Rechnen) 1 (1966), 233–255. MR 34 #3746.
39. ———, *Numerisch Behandlung von Differentialgleichungen*, Die Grundlehren der math. Wissenschaften, Band 60, Springer-Verlag, Berlin, 1951. MR 13, 285.
40. R. Courant and D. Hilbert, *Methoden der mathematischen Physik*, Vol. 1, 2nd ed. Vol. 2, Springer, Berlin, 1931, 1937.
41. R. Courant, K. O. Friedrichs and H. Lewy, *Über die partiellen Differenzgleichungen der matematischen Physik*, Math. Ann. 100 (1928), 32–74; English transl., IBM J. Res. Develop, 11 (1967), 215–234. MR 35 #4621.
42. Romulus Cristescu, *Sur la méthode des approximations successives pour des équations aux opérateurs*, Acad. R. P. Romîne Fil. Cluj Stud. Cerc. Mat. 12 (1961), 41–44.
43. B. P. Demidovič, I. A. Maron and E. Z. Šuvalova, *Numerical methods of analysis*, Fizmatgiz, Moscow, 1962. (Russian) MR 39 #1071.
44. V. Ju. Dīdik, *An approximate method for solving operator equations of a special type*, Dopovīdī Akad. Nauk Ukraïn. RSR Ser. A 1967, 490–492. (Ukrainian) MR 35 #2508.
45. C. L. Dolph, *Nonlinear integral equations of the Hammerstein type*, Trans. Amer. Math. Soc. 66 (1949), 289–307. MR 11, 367.
46. C. L. Dolph and G. J. Minty, *On nonlinear integral equations of the Hammerstein type*, Nonlinear Integral Equations (Proc. Advanced Seminar Conducted by Math. Research Center, U. S. Army, Univ. of Wisconsin, Madison, Wis., 1963), Univ. of Wisconsin Press, Madison, Wis., 1964, pp. 99–154. MR 28 #4322.
47. L. N. Dovbyš (Gagen-Torn) and S. G. Mihlin, *On the solvability of nonlinear Ritz systems*, Dokl. Akad. Nauk SSSR 138 (1961), 258–260. (Russian) MR 24 #B910.
48. M. Edelstein, *An extension of Banach's contraction principle*, Proc. Amer. Math. Soc. 12 (1961), 7–10. MR 22 #11375.
49. Hans Ehrmann, *Ein abstrakter Satz zur Konvergenzerzeugung und Konvergenzverbesserung für Iterationsverfahren bei nichtlinearen Gleichungen*, Z. Angew. Math. Mech. 37 (1957), 252–254.
50. ———, *Iterationsverfahren mit veränderlichen Operatoren*, Arch Rational Mech. Anal. 4 (1959), erratum, ibid. 6 (1960), 440. MR 22 #311; errata, 22, p. 2545.
51. D. K. Faddeev and V. N. Faddeeva, *Computational methods of linear algebra*, 2nd ed., Fizmatgiz, Moscow, 1963; English transl., Freeman, San Francisco, Calif., 1963. MR 28 #1742; #4659.
52. G. E. Forsythe and W. R. Wasow, *Difference methods of solution of partial differential equations*, Wiley, New York, 1960. MR 23 #B3156.
53. T. Frey, *Über ein neues Iterationsverfahren zur Lösung von Integral- und Integro-differentialgleichungen*, Sympos. Numerical Treatment of Ordinary Differential Equations, Integral and Integro-Differential Equations (Rome, 1960), Birkhäuser, Basel, 1960, pp. 384–387. MR 23 #B2606.
54. ———, *Study of the Picard and Carathéodory iteration methods*, Tájékoztató Magyar Tud. Akad. Számítastechn. Közp. 1966, no. 10, 27–95. (Hungarian) RŽMat. 1967 #25560.



55. V. M. Fridman, *New methods of solving a linear operator equation*, Dokl. Akad. Nauk SSSR 128 (1959), 482–484. (Russian) MR 22 #1066.
56. M. M. Gal', *A sufficient condition for the convergence of Ju. D. Sokolov's method for integral equations with deviating argument*, Abstracts of Papers of Drogobych State Ped. Inst. Eight Periodic Sci. Conf. (1966), Drogobič. Derž. Ped. Inst., Drogobych, 1966, pp. 59–63. (Ukrainian) MR 36 #7359.
57. ———, *Approximate solution of integral equations with retarded argument by the method of Ju. D. Sokolov*, Ukrain. Mat. Ž. 18 (1966), no. 6, 102–107. (Russian) MR 34 #5331.
58. ———, *Justification of the application of the method of averaging of functional corrections to determination of the spectral density of an error of an extremal pulse system with modulation*, Ukrain. Mat. Ž. 19 (1967), no. 3, 95–103. (Russian) MR 39 #7839.
59. B. G. Galerkin, *Rods and plates. Series in some problems of elastic equivalence of rods and plates*, Vestnik Inž. A1915, 897–908; reprinted in *Collected works*. Vol. 1, Izdat. Akad. Nauk SSSR, Moscow, 1952, pp. 168–195. (Russian)
60. M. K. Gavurin and L. V. Kantorovič, *Approximational and numerical methods, Forty Years of Mathematics in the USSR: 1917–1957*. Vol. 1: Survey articles, Fizmatgiz, Moscow, 1959, pp. 809–855. (Russian)
61. Michael Golomb, *Zur Theorie der nichtlinearen Integralgleichungen, Integralgleichungssysteme und allgemeinen Funktionalgleichungen*, Math. Z. 39 (1934/35), 45–75.
62. Ju. I. Griбанov, *On the projection method for solving linear equations in Banach spaces*, Izv. Vysš. Učebn. Zaved. Matematika 1965, no. 1 (44), 48–55. (Russian) MR 30 #4137.
63. A. Hammerstein, *Nichtlinear Integralgleichungen nebst Anwendungen*, Acta Math. 54 (1930), 117–176.
64. R. I. Kačurovskii, *On some fixed-point principles*, Moskov. Oblast. Ped. Inst. Učen. Zap. 96 (1960), 215–219. (Russian)
65. A. F. Kalaïda, *Research on and application of mean-value theorems*, Candidate's Dissertation, Inst. Kibernet. Akad. Nauk Ukrain. SSR, Kiev, 1965. (Russian)
66. O. F. Kalaïda and V. Ju. Sereda, *A general method for solving linear integral equations of the second kind*, Dopovid' Akad. Nauk Ukraïn. SSR Ser. A 1967, 492–495. (Ukrainian) MR 35 #2509.
67. L. V. Kantorovič, *Functional analysis and applied mathematics*, Uspehi Mat. Nauk 3 (1948), no. 6 (28), 89–185; English transl., Nat. Bur. Standards Rep. no. 1509, U. S. Dept. of Commerce, Nat. Bur. Standards, Washington, D. C., 1952. MR 10, 380; 14, 766.
68. ———, *On some further applications of the Newton approximation method*, Vestnik Leningrad. Univ. Ser. Mat. Meh. Astr. 12 (1957), no. 7, 68–103. (Russian) MR 19, 883.
69. L. V. Kantorovič and G. P. Akilov, *Functional analysis in normed spaces*, Fizmatgiz, Moscow, 1959; English transl., Internat. Ser. Monographs Pure and Appl. Math., vol. 46, Macmillan, New York, 1964. MR 22 #9837; 35 #4699.
70. L. V. Kantorovič and V. I. Krylov, *Approximate methods of higher analysis*, 5th ed., Fizmatgiz, Moscow, 1962; English transl. of 3rd ed., Interscience, New York; Noordhoff, Groningen, 1958. MR 21 #5268; 27 #4338.
71. L. V. Kantorovič, B. Z. Vulih and A. G. Pinsker, *Functional analysis in semi-ordered spaces*, GITTL, Moscow, 1950. (Russian) MR 12, 340.

72. M. V. Keldyš, *On Galerkin's method of solution of boundary problems*, Izv. Akad. Nauk SSSR Ser. Mat. 6 (1942), 309–330. (Russian) MR 5, 7.
73. I. I. Kolodner, *Equations of Hammerstein type in Hilbert spaces*, J. Math. Mech. 13 (1964), 701–750. MR 30 #1415.
74. J. Kolomý, *Some existence theorems for nonlinear problems*, Comment. Math. Univ. Carolinae 7 (1966), 207–217. MR 34 #6580.
75. Z. Kowalski, *An iterative method of solving differential equations*, Ann. Polon. Math. 12 (1962/63), 213–230. MR 26 #2013.
76. M. A. Krasnosel'skiĭ, *Convergence of Galerkin's method for nonlinear equations*, Dokl. Akad. Nauk SSSR 73 (1950), 1121–1124. (Russian) MR 12, 187.
77. ———, *Two remarks on the method of successive approximations*, Uspehi Mat. Nauk 10 (1955), no. 1 (63), 123–127. (Russian) MR 16, 833.
78. ———, *Topological methods in the theory of nonlinear integral equations*, GITTL, Moscow, 1956; English transl., Macmillan, New York, 1964. MR 20 #3464; 28 #2414.
79. M. A. Krasnosel'skiĭ and S. G. Kreĭn, *An iteration process with minimal residuals*, Mat. Sb. 31 (73) (1952), 315–334. (Russian) MR 14, 692.
80. M. A. Krasnosel'skiĭ and Ja. B. Rutickiĭ, *Certain approximate methods for solving nonlinear operator equations*, Proc. Fourth All-Union Math. Congr. (Leningrad, 1961), vol. II, "Nauka" Leningrad, 1964, pp. 562–571. (Russian) MR 36 #4399.
81. M. A. Krasnosel'skiĭ, P. P. Zabreĭko, E. I. Pustyĭnik and P. E. Sobolevskiĭ, *Integral operators in spaces of summable functions*, "Nauka", Moscow, 1966. (Russian) MR 34 #6568.
82. M. Kravčuk, *Sur la résolution des équations linéaires différentielles et intégrales par la méthode de moments*. I, II, Izdat. Akad. Nauk Ukrain. SSR, Kiev, 1932, 1936. (Ukrainian)
83. L. E. Krivošein, *On the approximate solution of some integro-differential equations*, Učen. Zap. Fiz.-Mat. Fak. Kirgiz. Univ. Vyp. 4 (1957), part 2, 39–68. (Russian) RŽMat. 1958 #9263.
84. ———, *Approximate solution of some problems for linear integro-differential equations*, Candidate's Dissertation, Central Asian State Univ., Frunze, 1958. (Russian) RŽMat. 1959 #7504.
85. ———, *Approximate methods for solution of ordinary linear integro-differential equations*, Izdat. Akad. Nauk Kirgiz. SSR, Frunze, 1962. (Russian) RŽMat. 1962 #11E160.
86. L. E. Krivošein and K. B. Barataliev, *On the approximate solution of nonlinear two-dimensional integro-differential equations with deviating argument*, Materials Thirteenth Sci. Conf. Professors and Instructors Phys.-Math. Faculty (Math. Section), "Mektep", Frunze, 1965, pp. 50–53. (Russian) RŽMat. 1966 #9E357.
87. M. M. Krylov, *Sur différentes généralisations de la méthode de W. Ritz et de la méthode de moindres carrés pour l'intégration approchée des équations de la physique mathématique*, Ukrain. Akad. Nauk Trudi Fiz.-Mat. Viddilu 3 (1926/27), no. 2. (Ukrainian)
88. ———, *Approximate solution of the basic problems of mathematical physics*, Izdat. Akad. Nauk Ukrain. SSR, Kiev, 1931. (Russian)
89. N. M. Krylov and N. N. Bologoljubov, *Sur le calcul des racines de la transcendante de Fredholm les plus voisines d'un nombre donné par les méthodes des moindres carrés et de*

*l'algorithme variationnel*, *Izv. Akad. Nauk SSSR Otdel. Fiz.-Mat. Nauk* (7) 1929, 471–488.

90. N. S. Kurpel', *On some approximate methods for solution of nonlinear equations in special Banach spaces*, *Proc. Sci. Conf. Engrs., Aspirants and Junior Research Assistants Inst. Math. Acad. Sci. Ukrain. SSR, Izdat. Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1963*, pp. 57–62. (Russian)

91. ———, *On the approximate solution of non-linear operator equations by the method of Ju. D. Sokolov*, *Ukrain. Mat. Ž.* 15 (1963), 309–314. (Russian) MR 29 #1546.

92. ———, *Estimate of the error of the projection method and Ju. D. Sokolov's method for nonlinear equations in a coordinate space*, *Dopovīdī Akad. Nauk Ukrain. RSR 1963*, no. 9, 1135–1139. (Ukrainian)

93. ———, *An approximate method of solving linear operator equations in Hilbert space*, *Dopovīdī Akad. Nauk Ukraїn. RSR 1963*, 1275–1279. (Ukrainian) MR 29 #2652.

94. ———, *Sufficient conditions for the convergence of the method of Ju. D. Sokolov for approximate solution of non-linear integral equations of Hammerstein type*, *Approximate Methods of Solving Differential Equations, Izdat. Akad. Nauk Ukrain. SSR, Kiev, 1963*, pp. 47–53. (Russian) MR 28 #5803.

95. ———, *On some approximate methods of solution of non-linear operator equations*, *Candidate's Dissertation, Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1963*. (Russian)

96. ———, *Some approximate methods of solving non-linear equations in a coordinate Banach space*, *Ukrain. Mat. Ž.* 16 (1964), 115–120. (Russian) MR 28 #4324.

97. ———, *Conditions for convergence and error estimates for a general iterative method of solution of linear operator equations*, *First Republ. Math. Conf. of Young Researchers, part I, Akad. Nauk Ukrain. SSR Inst. Mat., Kiev, 1965*, pp. 418–427. (Russian) MR 33 #4731.

98. ———, *Existence and uniqueness of solutions of a class of nonlinear operator equations*, *First Republ. Math. Conf. of Young Researchers, part I, Akad. Nauk Ukrain. ISSR Inst. Mat., Kiev, 1965*, pp. 428–434. (Russian) MR 33 #4732.

99. ———, *On a generalization of the method of averaging functional corrections*, *Dopovīdī Akad. Nauk Ukraїn. RSR 1965*, 1005–1009. (Ukrainian) MR 33 #6864.

100. ———, *The convergence and error estimates of certain general iterative methods of solution of operator equations*, *Dopovīdī Akad. Nauk Ukraїn. RSR 1965*, 1423–1427. (Ukrainian) MR 33 #6808.

101. ———, *Some general approximate methods for solving operator equations*, *Internat. Congress Math., Moscow, 1966, Abstracts, Section 14, p. 39*. (Russian)

102. ———, *Convergence and error estimates for an iterative projection method of solving operator equations*, *Proc. Second Sci. Conf. Young Ukrainian Mathematicians, "Naukova Dumka", Kiev, 1966*, pp. 361–365. (Ukrainian)

103. ———, *On an iterative projection method of solution of operator equations*, *Dopovīdī Akad. Nauk Ukraїn. RSR Ser. A 1967*, 218–222. (Ukrainian) MR 35 #3500.

104. M. Kwapisz, *On the iterative method of solving differential equations with retardations*, *Prace Mat.* 9 (1965), 57–68. MR 30 #5021.

105. ———, *On a certain iterative method of approximations and qualitative problems for functional-differential and differential equations in Banach space*, *Zeszyty Nauk Politech. Gdąnsk.* 79, *Mat.* 4 (1955), 3–73. (Polish)

106. ———, *On the approximate solutions of an abstract equation*, *Ann. Polon. Math.* 19 (1967), 47–60. MR 35 #1207.

107. O. A. Ladyženskaja, *The method of finite differences in the theory of partial differential equations*, *Uspehi Mat. Nauk* 12 (1957), no. 5 (77), 123–148; English transl., *Amer. Math. Soc. Transl. (2)* 20 (1962), 77–104. MR 20 #3395; 25 #342.
108. A. Langenbah, *On an application of the method of least squares to nonlinear equations*, *Dokl. Akad. Nauk SSSR* 143 (1962), 31–34 = *Soviet Math. Dokl.* 3 (1962), 330–334. MR 26 #2878.
109. V. I. Lebedev, *On the KP-method of improving the convergence of iterations in solving the kinetic equation*, *Ž. Vyčisl. Mat. i Mat. Fiz.* 6 (1966), no. 4, suppl., 154–176. (Russian) MR 36 #1127.
110. J. Leray and J. Schauder, *Topologie et équations fonctionnelles*, *Ann. Sci. École Norm. Sup. (3)* 51 (1934), 45–78.
111. L. A. Ljusternik and V. I. Sobolev, *Elements of functional analysis*, 2nd rev. ed., “Nauka”, Moscow, 1965; English transl. of 1st ed., Ungar, New York, 1961. MR 25 #5361; 35 #698.
112. A. Ju. Lučka, *A sufficient condition for the convergence of the procedure for averaging functional corrections*, *Dokl. Akad. Nauk SSSR* 122 (1958), 179–182. (Russian) MR 20 #4922.
113. ———, *Approximate solution of Fredholm integral equations by the method of averaged functional corrections*, *Ukrain. Mat. Ž.* 12 (1960), 32–45. (Russian) MR 28 #4316.
114. ———, *Approximate solution of linear operator equations in a Banach space by Ju. D. Sokolov's method*, *Ukrain. Mat. Ž.* 13 (1961), no. 1, 39–52. (Russian) MR 28 #5307.
115. ———, *The approximate solution of infinite systems of algebraic equations by Ju. D. Sokolov's method*, *Dopovīdī Akad. Nauk Ukraїn. RSR* 1961, 146–149. (Ukrainian) MR 23 #B566.
116. ———, *Approximate solution of linear operator equations in a Banach space by Ju. D. Sokolov's method*, *Dopovīdī Akad. Nauk Ukraїn. RSR* 1961, 424–428. (Ukrainian) MR 26 #4181.
117. ———, *On the theory and applications of the method of averaging functional corrections*, *Candidate's Dissertation*, Akad. Nauk Ukrain. SSR, Kiev, 1961. (Russian)
118. ———, *Approximate solution of infinite systems of linear integral equations by Ju. D. Sokolov's method*, *Dopovīdī Akad. Nauk Ukraїn. RSR* 1962, 1149–1153. (Ukrainian) MR 26 #1720.
119. ———, *Approximate solution of infinite systems of linear differential equations by the method of Ju. D. Sokolov*, *Dopovīdī Akad. Nauk Ukraїn. RSR* 1963, 563–567. (Ukrainian) MR 34 #5298.
120. ———, *Theory and application of the method of averaging functional corrections*, *Izdat. Akad. Nauk Ukrain. SSR*, Kiev, 1963; English transl., Academic Press, New York, 1965. MR 30 #4394; 32 #3298.
121. ———, *On an application of the method of Ju. D. Sokolov to the solution of a Dirichlet problem for the Poisson equation*, *Dopovīdī Akad. Nauk Ukraїn. RSR* 1965, 426–429. (Ukrainian) MR 32 #6696.
122. ———, *Application of the method of Ju. D. Sokolov to the solution of the exterior Neumann problem for the Poisson equation*, *Dopovīdī Akad. Nauk Ukraїn. RSR* 1965, 547–550. (Ukrainian) MR 32 #2753.

123. A. Ju. Lučka, *Approximate solution of operator equations by an iteration projection method*, Internat. Congr. Math., Moscow, 1966, Abstracts, Section 14, p. 41. (Russian)
124. A. Ju. Lučka and N. S. Kurpel', *On a non-stationary iteration method for the approximate solution of linear operator equations*, Ukrain. Mat. Ž. 16 (1964), 389–395. (Russian) MR 29 #3885.
125. A. E. Martynjuk, *Certain approximate methods of solution of nonlinear equations with unbounded operators*, Izv. Vysš. Učebn. Zaved. Matematika 1966, no. 6 (55), 85–94. (Russian) MR 34 #6573.
126. S. G. Mihlin, *Direct methods in mathematical physics*, GITTL, Moscow, 1950. (Russian) MR 16, 41.
127. ———, *Variational methods in mathematical physics*, GITTL, Moscow, 1957; English transl., Macmillan, New York, 1964. MR 22 #1881; 30 #2712.
128. ———, *The numerical performance of variational methods*, "Nauka", Moscow, 1966; English transl., Wolters-Noordhoff, Groningen, 1971. MR 34 #3747; 43 #4236.
129. Ju. M. Molokovič, *An approximation method for the solution of linear integral equations*, Izv. Vysš. Učebn. Zaved. Matematika 1959, no. 5 (12), 164–170. (Russian) MR 27 #3098.
130. ———, *The approximate solution of linear integral equations by means of a certain variant of Ju. D. Sokolov's method*, Kazan. Gos. Univ. Učen. Zap. 127 (1967), kn. 1, 139–147. (Russian) MR 41 #1255.
131. B. G. Mosolov, *On an approximation method of solving a non-linear integro-differential equation*, Izv. Akad. Nauk UzSSR Ser. Fiz.-Mat. 1961, no. 2, 41–51. (Russian) MR 31 #5053.
132. ———, *On an approximate method of solving linear operator equations in the metric space  $L_2$* , Izv. Akad. Nauk UzSSR Ser. Fiz.-Mat. Nauk 1961, no. 5, 29–34. (Russian) MR 31 #589.
133. ———, *Approximate solution of operator equations by the method of Ju. D. Sokolov*, Izv. Akad. Nauk UzSSR Ser. Fiz.-Mat. Nauk 1963, no. 5, 26–29. (Russian) MR 29 #3002.
134. ———, *On approximate solution of linear weighted integral equations by Ju. D. Sokolov's method*, Integration Certain Differential Equations Math. Phys., Izdat. "Nauka", Uzbek. SSR, Tashkent, 1964, pp. 168–182. (Russian) MR 34 #980.
135. ———, *Approximate solution of some functional equations by the method of averaging functional corrections*, Candidate's Dissertation, Akad. Nauk Uzbek. SSR, Tashkent, 1965. (Russian)
136. ———, *Approximate solution of operator equations of the first kind by the method of averaging functional corrections*, Voprosy Vyčisl. Mat. i Tehn., vyp. 7, "Nauka", Tashkent 1965, pp. 20–26. (Russian) RŽMat, 1966 #55496.
137. ———, *Approximate solution of systems of nonlinear integro-differential equations by the method of averaging functional corrections*, Voprosy Kibernet. i. Vyčisl. Mat., vyp. 2, "Fan", Tashkent, 1966, pp. 66–73. (Russian) RŽMat. 1967 #75493.
138. A. D. Myškis and I. Ju. Ègle, *On an estimate of the error in the method of successive approximations*, Mat. Sb. 35 (77) (1954), 491–500. (Russian) MR 16, 862.
139. I. P. Mysovskih, *A method of mechanical quadrature for solving integral equations*, Vestnik Leningrad. Univ. 17 (1962), no. 7, 78–88. (Russian) MR 26 #5758.
140. M. Z. Nashed, *On general iterative methods for the solutions of a class of non-*

- linear operator equations*, Math. Comp. 19 (1965), 14–24. MR 31 #4143.
141. N. N. Nazarov, *Non-linear integral equations of Hammerstein's type*, Acta Univ. Asiae Mediae = Trudy Sredneaziatsk Gos. Univ. Ser. V-a (1941), fasc. 33, 79 pp. (Russian) MR 3, 150.
142. V. V. Nemyckii, *Théorèmes d'existence et d'unicité des solutions de quelques équations intégrales non-linéaires*, Mat. Sb. 41 (1934), 421–438; Russian transl., *ibid.*, 438–452.
143. ———, *The fixed-point method in analysis*, Uspehi Mat. Nauk 1 (1936), 141–174; English transl., Amer. Math. Soc. Transl. (2) 34 (1963), 1–37.
144. Carl Gottfried Neumann, *Untersuchungen über das logarithmische und Newton'sche Potential*, Teubner, Leipzig, 1877.
145. C. Olech, *A connection between two certain methods of successive approximations in differential equations*, Ann. Polon. Math. 11 (1962), 237–245. MR 25 #2258.
146. G. I. Petrov, *Application of Galerkin's method to the problem of stability of flow of a viscous fluid*, Prikl. Mat. Meh. 4 (1940), 3–12. (Russian)
147. W. V. Petryshyn, *Direct and iterative methods for the solution of linear operator equations in Hilbert space*, Trans. Amer. Math. Soc. 105 (1962), 136–175. MR 26 #3180.
148. ———, *On a general iterative method for the approximate solution of linear operator equations*, Math. Comp. 17 (1963), 1–10. MR 29 #729.
149. ———, *On the extension and the solution of nonlinear operator equations*, Illinois J. Math. 10 (1966), 255–274. MR 34 #8242.
150. M. Picone, *Sull'equazione integrale non lineare di Volterra*, Ann. Mat. Pura Appl. (4) 49 (1960), 1–10. MR 22 #2867.
151. ———, *Sull'equazione integrale non lineare di seconda specie di Fredholm*, Math. Z. 74 (1960), 119–128. MR 22 #9826.
152. S. I. Pohožaev, *Analogue of Schmidt's method for nonlinear equations*, Dokl. Akad. Nauk SSSR 136 (1961), 546–548 = Soviet Math. Dokl. 2 (1961), 103–105. MR 22 #5859.
153. G. N. Položii (Editor), *Mathematical practicum*, Fizmatgiz, Moscow, 1960. (Russian) MR 22 #12683.
154. G. M. Položii and P. Ī. Čalenko, *The strip method of solving integral equations*, Dopovidī Akad. Nauk Ukraīn. RSR 1962, 427–431. (Ukrainian) MR 28 #5575.
155. ———, *Solution of integral equations by the band method*, Problems Math. Phys. and Theory of Functions, Izdat. Akad. Nauk Ukraīn. SSR, Kiev, 1964, pp. 124–144. (Russian) MR 32 #2859.
156. N. I. Pol'skii, *Some generalizations of B. G. Galerkin's method*, Dokl. Akad. Nauk SSSR 86 (1952), 469–472. (Russian) MR 14, 384.
157. ———, *On the convergence of certain approximate methods of analysis*, Ukrain. Mat. Ž. 7 (1955), 56–70. (Russian) MR 17, 64.
158. ———, *On a general scheme of application of approximation methods*, Dokl. Akad. Nauk SSSR 111 (1956), 1181–1184. (Russian) MR 18, 802.
159. ———, *Projective methods in applied mathematics*, Dokl. Akad. Nauk SSSR 143 (1962), 787–790 = Soviet Math. Dokl. 3 (1962), 488–491. MR 26 #3173.
160. R. D. Richtmyer, *Difference methods for initial-value problems*, Interscience Tracts in Pure and Appl. Math., no. 4, Interscience, New York, 1957. MR 20 #438.

161. F. Riesz and B. Sz.-Nagy, *Leçons d'analyse fonctionnelle*, 2nd ed., Akad. Kiadó, Budapest, 1953; English transl., Ungar, New York, 1955. MR 15, 132; 17, 175.
162. Walter Ritz, *Über eine neue Methode zur Lösung gewisser Variationsprobleme der mathematischen Physik*, J. Reine Angew. Math. 135 (1909), 1–61.
163. ———, *Gesammelte Werke – Walther Ritz – Oeuvres*, Gauthier-Villars, Paris, 1911.
164. T. Sabirov and A. R. Esajan, *The question of convergence of the averaging method of functional corrections*, Dokl. Akad. Nauk Tadžik SSR 9 (1966), no. 1, 8–12. (Russian) MR 34 #1893.
165. G. S. Salehov and M. A. Mertvecova, *Convergence of certain iterative processes*, Izv. Kazan. Fil. Akad. Nauk SSSR Ser. Fiz.-Mat. Tech. Nauk 1954, vyp. 5, 77–108; Chinese transl., *Advancement in Math.* 3 (1957), 341–374. RŽMat. 1956 #2460; MR 20 #7380.
166. H. Schaefer, *Über die Methode der a priori-Schranken*, Math. Ann. 129 (1955), 415–416. MR 17, 175.
167. J. Schauder, *Der Fixpunktsatz in Funktionalräumen*, Studia Math. 2 (1930), 171–180.
168. J. W. Schmidt, *Konvergenzuntersuchungen und Fehlerabschätzungen für ein verallgemeinertes Iterationsverfahren*, Arch. Rational Mech. Anal. 6 (1960), 261–276. MR 27 #3069.
169. ———, *Fehlerabschätzungen mit Hilfe eines Vergleichssatzes*, Z. Angew. Math. Mech. 42 (1962), 187–193. MR 25 #756.
170. ———, *Ein Vergleichssatz unter Verwendung höherer Ableitungen*, Z. Angew. Math. Mech. 43 (1963), 81–83. MR 26 #5425.
171. ———, *Zur Fehlerabschätzung näherungsweise Lösungen von Gleichungen in halbgeordneten Räumen*, Arch. Math. 14 (1963), 130–138. MR 26 #7141.
172. J. Schröder, *Das Iterationsverfahren bei allgemeinerem Abstands begriff*, Math. Z. 66 (1956), 111–116. MR 18, 765.
173. ———, *Neue Fehlerabschätzungen für verschiedene Iterationsverfahren*, Z. Angew. Math. Mech. 36 (1956), 168–181. MR 18, 152.
174. ———, *Nichtlineare Majoranten beim Verfahren der schrittweisen Näherung*, Arch. Math. 7 (1957), 471–484. MR 19, 460.
175. S. V. Simeonov, *A successive approximation process and its application in solving functional equations with non-linear operators of monotonic type*, Dokl. Akad. Nauk SSSR 138 (1961), 1033–1034 = Soviet Math. Dokl. 2 (1961), 790–791. MR 25 #3390.
176. ———, *On a process of successive approximations and its application to the solution of functional equations with nonlinear operators of monotone type*, Godisnik Inž.-Stroit. Inst. Fak. Stroit. Arhitekt. i Hidrotehn. 14 (1962), no. 1, 9–21 (1963). (Bulgarian) RŽMat. 1965 #7E465.
177. ———, *The application of a process of successive approximations to the solution of certain types of functional equations*, Dokl. Akad. Nauk SSSR 148 (1963), 534–537 = Soviet Math. Dokl. 4 (1963), 144–147. MR 27 #489.
178. V. H. Sirenko, *On the numerical realization of the method of averaging functional corrections*, Ukrain. Mat. Ž. 13 (1961), no. 4, 51–66. (Russian) MR 26 #2030.
179. S. N. Slugin, *Approximate solution of operator equations on the basis of S. A. Čaplygin's method*, Dokl. Akad. Nauk SSSR 103 (1955), 565–568, 746. (Russian) MR 17, 387.

180. N. S. Smirnov, *Introduction to the theory of nonlinear integral equations*, ONTI, Moscow, 1936. (Russian)
181. V. I. Smirnov, *A course in higher mathematics*. Vol. 5, rev. ed., Fizmatgiz, Moscow, 1959; English transl., Pergamon Press, Oxford; Addison-Wesley, Reading, Mass., 1964. MR 25 #5141; 29 #5964.
182. S. L. Sobolev, *Applications of functional analysis in mathematical physics*, Izdat. Leningrad. Gos. Univ., Leningrad, 1950; English transl., Transl. Math. Monographs, vol. 7, Amer. Math. Soc., Providence, R.I., 1963. MR 14, 565; 29 #2624.
183. Ju. D. Sokolov, *On a problem of the theory of unsteady motion of ground water*, Ukrain. Mat. Ž. 5 (1953), 159–170. (Russian) MR 15, 476.
184. ———, *On the theory of plane unsteady filtration of ground water*, Ukrain. Mat. Ž. 6 (1954), 218–232. (Russian) MR 18, 91.
185. ———, *On approximate solution of the basic equation of the dynamics of a hoisting cable*, Dopovīdī Akad. Nauk Ukraїn. RSR 1955, 21–25. (Ukrainian) MR 17, 307.
186. ———, *On an axially symmetric problem of the theory of unsteady motion of ground water*, Ukrain. Mat. Ž. 7 (1955), 101–111. (Russian) MR 18, 91.
187. ———, *On a method of approximate solution of linear integral and differential equations*, Dopovīdī Akad. Nauk Ukrain. RSR 1955, 107–111. (Ukrainian) MR 17, 196.
188. ———, *On the determination of dynamic pull in shaft-lifting cables*, Akad. Nauk Ukrain. RSR Prikl. Meh. 1 (1955), 23–25. (Ukrainian) MR 18, 609.
189. ———, *Sur la méthode du moyennage des corrections fonctionnelles*, Ukrain. Mat. Ž. 9 (1957), 82–100. (Russian) MR 19, 687.
190. ———, *Sur l'application de la méthode des corrections fonctionnelles moyennes aux équations intégrales non linéaires*, Ukrain. Mat. Ž. 9 (1957), 394–412. (Russian) MR 21 #2888.
191. ———, *Sur la résolution approchée des équations intégrales linéaires du type de Volterra*, Ukrain. Mat. Ž. 10 (1958), no. 2, 193–208. (Russian) MR 20 #7393.
192. ———, *Sur une méthode de la résolution approchée des équations intégrales non linéaires à limites variables*, Ukrain. Mat. Ž. 10 (1958), 419–433. (Russian) MR 21 #977.
193. ———, *Sur l'application de la méthode des corrections fonctionnelles moyennes aux équations du type parabolique linéaires par rapport aux dérivées*, Ukrain. Mat. Ž. 12 (1960), 181–195. (Russian) MR 28 #4315.
194. ———, *On a method of approximate solution of systems of linear integral equations*, Ukrain. Mat. Ž. 13 (1961), no. 4, 79–87. (Russian) MR 26 #2031.
195. ———, *On a method of approximate solution of systems of nonlinear integral equations with constant limits*, Ukrain. Mat. Ž. 15 (1963), 58–70. (Russian) MR 26 #5385.
196. ———, *On sufficient tests for the convergence of the method of averaging functional corrections*, Ukrain. Mat. Ž. 17 (1965), no. 3, 91–103. (Russian) MR 33 #1770;
197. ———, *The method of averaging of functional corrections*, "Naukova Dumka", Kiev, 1967. (Russian) MR 35 #3931.
198. A. A. Stonickiĭ, *On the solution of some classes of linear differential and integro-differential equations with small parameter*, Candidate's Dissertation, Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev., 1963. (Russian)



199. A. A. Stonickii\*, *Approximate solution, by the method of Ju. D. Sokolov, of an infinite system of integral equations of Volterra type depending on a parameter*, *Dopovidi Akad. Nauk Ukrain. RSR* 1963, 1555–1559. (Ukrainian) MR 29 #2610.
200. I. T. Švec', V. Ī. Fedorov and V. G. Bodnarčuk, *Application of some approximate methods to the solution of the equation of heat conduction in the rotors of a turbine*, *Zb. Prac' Inst. Teploenerget. Akad. Nauk Ukrain. SSR Vyp.* 18 (1960), 3–15. (Ukrainian)
201. A. Tarski, *A lattice-theoretical fixpoint theorem and its applications*, *Pacific J. Math.* 5 (1955), 285–309. MR 17, 574.
202. A. N. Tihonov, *Ein Fixpunktsatz*, *Math. Ann.* 111 (1935), 767–776.
203. V. I. Tivončuk, *On the application of the method of averaging functional corrections to the solution of linear integral equations of Volterra type*, *Proc. Sci. Conf. Engrs., Aspirants and Junior Research Assistants Inst. Math. Acad. Sci. Ukrain. SSR*, Izdat. Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1963, pp. 73–76. (Russian)
204. ———, *Application of the method of Ju. D. Sokolov to the solution of linear integral equations of mixed type*, *Dopovidi Akad. Nauk Ukrain. RSR* 1964, 1014–1018. (Ukrainian) MR 30 #2304.
205. ———, *An error bound for a variant of Ju. D. Sokolov's method of solving linear integral equations of Volterra type and equations of mixed type*, *Dopovidi Akad. Nauk Ukrain. RSR* 1964, 1281–1284. (Ukrainian) MR 30 #2305.
206. ———, *On the solution of linear integral equations of mixed type by means of a variant of the method of Ju. D. Sokolov*, *Dopovidi Akad. Nauk Ukrain. RSR* 1964, 1559–1563. (Ukrainian) MR 30 #3347.
207. ———, *The solution of linear integral equations of Volterra type by a variant of the method of Ju. D. Sokolov*, *Ukrain. Mat. Ž.* 17 (1965), no. 1, 77–88. (Russian) MR 32 #8083.
208. ———, *On the solution of Volterra linear integral equations and equations of mixed type in  $L^P$ -space by a variant of the method of Ju. D. Sokolov*, *Ukrain. Mat. Ž.* 17 (1965), no. 4, 133–139. (Russian) MR 33 #3062.
209. ———, *On the application of the method of averaging functional corrections to the solution of linear Volterra integral equations and linear integral equations of mixed type*, *Candidate's Dissertation Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1965.* (Russian)
210. ———, *Solution of linear integral equations of Volterra type and equations of mixed type by means of a variant of a method of Ju. D. Sokolov*, *First Republ. Math. Conf. of Young Researchers, part I, Akad. Nauk Ukrain. SSR Inst. Mat., Kiev, 1965*, pp. 628–635. (Russian) MR 33 #6317.
211. ———, *A variant of the method of averaging functional corrections for solution of linear integral equations of mixed type*, *Differencial'nye Uravnenija* 2 (1966), 1228–1238 = *Differential Equations* 2 (1966), 636–641. MR 34 #4841.
212. ———, *On a variant of the method of averaging functional corrections for the solution of a linear integral equation of mixed type*, *Proc. Second Conf. Young Ukrainian Mathematicians, "Naukova Dumka", Kiev, 1966*, pp. 601–605. (Ukrainian)
213. J. Todd (Editor), *Survey of numerical analysis*, McGraw-Hill, New York, 1962. MR 24 #B1271.
214. Marko Todorow, *Über die iterative Behandlung linearer Gleichungssysteme*, *Bautechnik* 35 (1958), no. 4, 136–138. RŽMat. 1959 #877.

215. F. G. Tricomi, *Integral equations*, Pure and Appl. Math., vol. 5, Interscience, New York, 1957. MR 20 #1177.
216. N. I. Tukalevskaia, *Numerical realization of the method of averaging functional corrections for integral equations of Volterra type*, Proc. Sci. Conf. Engrs., Aspirants and Junior Research Assistants Inst. Math. Acad. Sci. Ukrain. SSR, Izdat. Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1963, pp. 77–83. (Russian)
217. ———, *On a certain method of solving linear integral equations of Volterra type*, Dopovidī Akad. Nauk Ukrain. RSR 1965, 998–1002. (Ukrainian) MR 33 #5155.
218. ———, *Approximate solution of linear integral equations of Volterra type*, First Republ. Math. Conf. of Young Researchers, part I, Akad. Nauk Ukrain. SSR Inst. Mat., Kiev, 1965, pp. 636–640. (Russian) MR 33 #6318.
219. ———, *On a certain method of approximate solution of Volterra type linear integral equations in the class of  $L^p$ -functions*, Dopovidī Akad. Nauk Ukrain. RSR 1966, 299–302. (Ukrainian) MR 33 #4629.
220. ———, *On a method of approximate solution of linear Volterra integral equations and equations of mixed type*, Candidate's Dissertation, Inst. Mat. Akad. Nauk Ukrain. SSR, Kiev, 1966. (Russian)
221. ———, *On a method of approximate solution of linear integral equations of mixed type in  $L^p$ -spaces*, Proc. Second Sci. Conf. Young Ukrainian Mathematicians, "Naukova Dumka", Kiev, 1966, p. 609. (Ukrainian)
222. N. I. Tukalevskaia and A. V. Nesterčuk, *On a method of solving linear integral equations of Volterra type*, Ukrain. Mat. Ž. 17 (1965), no. 1, 95–101. (Russian) MR 32 #8084.
223. M. M. Vaĭnberg, *Variational methods for the study of non-linear operators*, GITTL, Moscow, 1956; English transl., Holden-Day, San Francisco, Calif., 1964. MR 19, 567; 31 #638.
224. ———, *On the convergence of the method of steepest descents for non-linear equations*, Dokl. Akad. Nauk SSSR 130 (1960), 9–12 = Soviet Math. Dokl. 1 (1960), 1–4. MR 25 #571.
225. G. M. Vaĭnikko, *On the question of convergence of Galerkin's method*, Tartu Riikl. Üli. Toimetises Vih. 177 (1965), 148–153. (Russian) MR 36 #1094.
226. ———, *The perturbed Galerkin method and the general theory of approximate methods for nonlinear equations*, Ž. Vyčisl. Mat. i Mat. Fiz. 7 (1967), 723–751 = USSR Comput. Math. and Math. Phys. 7 (1967), no. 4, 1–41. MR 36 #1095.
227. Vo-Khac Khoan,  *$Q$ -solutions d'un système différentiel*, C. R. Acad. Sci. Paris 258 (1964), 3430–3433. MR 29 #500.
228. Ju. V. Vorob'ev, *Method of moments in applied mathematics*, Fizmatgiz, Moscow, 1958; English transl., Gordon and Breach, New York, 1965. MR 21 #7591; 32 #1872.
229. B. Z. Vulih, *Introduction to theory of partially ordered spaces*, Fizmatgiz, Moscow, 1961; English transl., Noordhoff, Groningen, 1967. MR 24 #A3494; 37 #121.
230. Sheng-wang Wang, *On the solutions of the Hammerstein integral equations*, Bull. Acad. Polon. Sci. Sér. Sci. Math. Astronom. Phys. 8 (1960), 339–342. MR 23 #A2727.
231. J. Warga, *On a class of iterative procedures for solving normal systems of ordinary differential equations*, J. Math. Physics 31 (1953), 223–243. MR 14, 587.

232. T. Ważewski, *Sur la méthode des approximations successives*, Ann. Soc. Polon. Math. 16 (1938), 214–215.
233. ———, *Sur une extension du procédé de I. Jungermann pour établir la convergence des approximations successives au cas des équations différentielles ordinaires*, Bull. Acad. Polon. Sci. Sér. Sci. Math. Astronom. Phys. 8 (1960), 43–46. MR 23 #A3404.
234. ———, *Sur un procédé de prouver la convergence des approximations successives sans utilisation des séries de comparaison*, Bull. Acad. Polon. Sci. Sér. Sci. Math. Astronom. Phys. 8 (1960), 47–52. MR 23 #A3405.
235. J. Weissinger, *Zur Theorie und Anwendung des Iterationsverfahrens*, Math. Nachr. 8 (1952), 193–212. MR 14, 478.
236. R. Zuber, *A certain algorithm for solving ordinary differential equations of the first order. I*, Zastos. Mat. 8 (1966), 351–363. (Polish) MR 33 #6844.
237. ———, *A certain algorithm for solving ordinary differential equations of the first order. II*, Zastos. Mat. 9 (1966), 85–98. (Polish) MR 34 #3799.
238. ———, *A method of successive approximation*, Bull. Acad. Polon. Sci. Sér. Sci. Math. Astronom. Phys. 14 (1966), 559–561. MR 35 #5684.

