

# Special variants of collocation method for integral equations in a singular case

Gabbasov N., Zamaliev R.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

---

## Abstract

© 2017, Allerton Press, Inc. The present paper deals with a linear integral equation of the third kind with fixed singularities in its kernel. We propose and substantiate special generalized methods for its approximate solving in a space of generalized functions.

<http://dx.doi.org/10.3103/S1066369X1705005X>

---

## Keywords

approximate solution, collocation method, integral equation of the third kind, space of generalized functions, theoretical substantiation

## References

- [1] Hadamard, J.-S. *Le Problème de Cauchy et les équations aux Dérivées Partielles Linéaires Hyperboliques* (Herman, Paris, 1932; Nauka, Moscow, 1978).
- [2] Bart, G. R., Warnock, R. L. "Linear Integral Equations of the Third Kind", *SIAM J. Math. Anal.* 4, No. 4, 609-622 (1973).
- [3] Case, K., Zwaifel, P. *Linear Theory of Transfer* (Mir, Moscow, 1972).
- [4] Zamaliev, R. R. "Direct Methods for Solving Integral Equations of the Third Kind with Singularities in a Kernel", Candidate's dissertation in Mathematics and Physics (Kazan Federal University, Kazan, 2012).
- [5] Bzhikhatlov, Kh. G. "A Boundary-Value Problem with a Shift", *Differ. Uravn.* 9, No. 1, 162-165 (1973) [in Russian].
- [6] Gabbasov, N. S. "Methods for Solving an Integral Equation of the Third Kind with Fixed Singularities in the Kernel", *Differ. Equ.* 45, No. 9, 1370-1378 (2009).
- [7] Gabbasov, N. S. and Zamaliev, R. R. "New Versions of Spline Methods for Integral Equations of the Third Kind with Singularities in the Kernel", *Differ. Equ.* 46, No. 9, 1330-1338 (2010).
- [8] Gabbasov, N. S. and Zamaliev, R. R. "A New Variant of the Subdomain Method for Integral Equations of the Third Kind with Singularities in the Kernel", *Russian Mathematics* 55, No. 5, 8-13 (2011).
- [9] Gabbasov, N. S. "A New Version of the Collocation Method for a Class of Integral Equations in the Singular Case", *Differ. Equ.* 49, No. 9, 1142-1149 (2013).
- [10] Gabbasov, N.S. "Special Direct Method for Solving Integral Equations in the Singular Case", *Differ. Equ.* 50, No. 9, 1232-1239 (2014).
- [11] Gabdulkaev, B. G. *Optimal Approximations for Solutions of Linear Problems* (Kazan Univ. Press, Kazan, 1980) [in Russian].
- [12] Prößdorf, S. "Über Systeme von singulären Integralgleichungen mit einem verschwindenden Symbol", *Mat. Issled.* 7, No. 2, 129-142 (1972).
- [13] Gabbasov, N. S. *Methods for Solving Fredholm Integral Equations in Spaces of Generalized Functions* (Kazan Univ. Press, Kazan, 2006) [in Russian].
- [14] Natanson, I. P. *Constructive Theory of Functions* (Gostekhizdat, Moscow-Leningrad, 1949) [in Russian].

[15] Petersen, I. "Über die Konvergenz der Näherungsmethoden vom Interpolationstypus für gewöhnliche Differentialgleichungen", Izv. Akad. Nauk Ehst. SSR, Ser. Fiz.-Mat. Tekh. Nauk 10, 3-12 (1961) [in Russian].