ISSN 1061-0022 (print)
ISSN 1547-7371 (online)

# St. Petersburg Mathematical Journal

(Formerly Leningrad Mathematical Journal)

**Volume 34 Number 4 August 2023**

*A Translation of*

РОССИЙСКАЯ АКАДЕМИЯ НАУК

# АЛГЕБРА И АНАЛИЗ

ТОМ 34 № 4 2022

AMS American Mathematical Society
Providence, Rhode Island USA

**ST. PETERSBURG MATHEMATICAL JOURNAL**
(Formerly Leningrad Mathematical Journal)
*A translation of the Russian bimonthly*
Алгебра и анализ
"Наука", С.-Петербургское отделение, 2022 г.

**Editor-in-Chief**: S. V. Kislyakov

**Editorial Board**

A. B. Aleksandrov
A. D. Baranov
(Managing Editor)
A. A. Borichev
A. L. Chistov
I. A. Dynnikov
S. V. Ivanov
A. E. Litvak
A. V. Malyutin
A. I. Nazarov
N. K. Nikol′skiĭ
I. A. Panin
F. V. Petrov
S. Yu. Pilyugin
M. A. Semenov-Tyan-Shanskiĭ
T. A. Suslina
(Managing Editor)
P. B. Zatitskii
(Managing Secretary)

**Editorial Council**: V. M. Babich, N. Yu. Netsvetaev and O. Ya. Viro

**SUBSCRIPTION INFORMATION.** The *St. Petersburg Mathematical Journal* is published six times per year and is also accessible electronically from `www.ams.org/journals/`. Individual subscription prices for Volume 34 (2023) are as follows. For electronic only: US$2715. For paper delivery with free electronic access: US$2858. Add US$12 for delivery within the United States; US$18 for surface delivery outside the United States. For information on institutional pricing, please visit `https://www.ams.org/publications/journals/subscriberinfo`. Subscription renewals are subject to late fees. See `www.ams.org/journal-faq` for more journal subscription information.

**BACK NUMBER INFORMATION.** For back issues see `www.ams.org/backvols`.

Orders for subscriptions and publications of the American Mathematical Society should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2213 USA.

**COPYING AND REPRINTING.** Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication is permitted only under license from the American Mathematical Society. Requests for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information about requests for permission, please visit `www.ams.org/publications/pubpermissions`.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

**St. Petersburg Mathematical Journal** (ISSN 1061-0022 (print); ISSN 1547-7371 (online)) is published bimonthly by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA. Periodicals postage paid at Providence, Rhode Island. Postmaster: Send address changes to St. Petersburg Mathematical Journal, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA.

**Manuscripts** should be addressed to "Algebra i Analiz", St. Petersburg Publishing Company of the Russian Academy of Sciences, Mendeleevskaya Liniya 1, St. Petersburg 199034, Russia. Submitting simultaneously a tex-file to the address `pmj@pdmi.ras.ru` is highly appreciated.

© 2023 American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews* and *Zentralblatt MATH*.
This journal is archived in *Portico* and in *CLOCKSS*.
Translation authorized by the All-Union Agency for Author's Rights, Moscow.
Printed in the United States of America.
♾ The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1 28 27 26 25 24 23

ISSN 1061-0022 (print)
ISSN 1547-7371 (online)

# St. Petersburg Mathematical Journal

**Volume 34 Number 4 August 2023**

*A Translation of*

РОССИЙСКАЯ АКАДЕМИЯ НАУК

# АЛГЕБРА И АНАЛИЗ

ТОМ 34 № 4 2022

AMS American Mathematical Society
Providence, Rhode Island USA

**ST. PETERSBURG MATHEMATICAL JOURNAL**
(Formerly Leningrad Mathematical Journal)
*A translation of the Russian bimonthly*
Алгебра и анализ
"Наука", С.-Петербургское отделение, 2022 г.

**Editor-in-Chief**: S. V. Kislyakov

**Editorial Board**

A. B. Aleksandrov
A. D. Baranov
(Managing Editor)
A. A. Borichev
A. L. Chistov
I. A. Dynnikov
S. V. Ivanov
A. E. Litvak
A. V. Malyutin
A. I. Nazarov
N. K. Nikol′skiĭ
I. A. Panin
F. V. Petrov
S. Yu. Pilyugin
M. A. Semenov-Tyan-Shanskiĭ
T. A. Suslina
(Managing Editor)
P. B. Zatitskii
(Managing Secretary)

**Editorial Council**: V. M. Babich, N. Yu. Netsvetaev and O. Ya. Viro

**SUBSCRIPTION INFORMATION.** The *St. Petersburg Mathematical Journal* is published six times per year and is also accessible electronically from `www.ams.org/journals/`. Individual subscription prices for Volume 34 (2023) are as follows. For electronic only: US$2715. For paper delivery with free electronic access: US$2858. Add US$12 for delivery within the United States; US$18 for surface delivery outside the United States. For information on institutional pricing, please visit `https://www.ams.org/publications/journals/subscriberinfo`. Subscription renewals are subject to late fees. See `www.ams.org/journal-faq` for more journal subscription information.

**BACK NUMBER INFORMATION.** For back issues see `www.ams.org/backvols`.

Orders for subscriptions and publications of the American Mathematical Society should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2213 USA.

**COPYING AND REPRINTING.** Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication is permitted only under license from the American Mathematical Society. Requests for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information about requests for permission, please visit `www.ams.org/publications/pubpermissions`.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

**St. Petersburg Mathematical Journal** (ISSN 1061-0022 (print); ISSN 1547-7371 (online)) is published bimonthly by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA. Periodicals postage paid at Providence, Rhode Island. Postmaster: Send address changes to St. Petersburg Mathematical Journal, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213 USA.

**Manuscripts** should be addressed to "Algebra i Analiz", St. Petersburg Publishing Company of the Russian Academy of Sciences, Mendeleevskaya Liniya 1, St. Petersburg 199034, Russia. Submitting simultaneously a tex-file to the address `pmj@pdmi.ras.ru` is highly appreciated.

© 2023 American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews* and *Zentralblatt MATH*.
This journal is archived in *Portico* and in *CLOCKSS*.
Translation authorized by the All-Union Agency for Author's Rights, Moscow.
Printed in the United States of America.
♾ The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1 28 27 26 25 24 23

## CONTENTS

### Research Papers

**T. A. Alexeeva and N. A. Shirokov,** Hölder classes in the $L^p$ norm on a chord-arc curve in $\mathbb{R}^3$ ..... 557

**O. L. Vinogradov,** On the constants in abstract inverse theorems of approximation theory ..... 573

**P. Gvozdevsky,** Overgroups of subsystem subgroups in exceptional groups: inside a sandwich ..... 591

**S. E. Pastukhova,** Improved resolvent $L^2$-approximations in homogenization of fourth order operators ..... 611

**B. A. Plamenevskii and A. S. Poretskii,** The Maxwell system in nonhomogeneous anisotropic waveguides with slowly stabilizing characteristics of the filling medium ..... 635

**Yu. S. Saranchuk and A. B. Shishkin,** General elementary solution of a $q$-sided convolution type homogeneous equation ..... 695

**A. Chapman,** Symbol length of classes in Milnor $K$-groups ..... 715

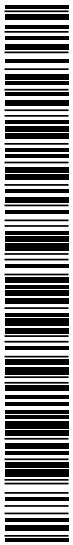
## RUSSIAN CONTENTS*

## СОДЕРЖАНИЕ

### Статьи

*Алексеева Т. А., Широков Н. А.* Классы Гёльдера в $L^p$-норме на *chord-arc* кривой в $\mathbb{R}^3$ . . . . . 1
*Виноградов О. Л.* О константах в абстрактных обратных теоремах теории приближений . . . . . 22
*Гвоздевский П. Б.* Надгруппы подсистемных подгрупп в исключительных группах: внутри сэндвича . . . . . 47
*Пастухова С. Е.* Улучшенные $L^2$-аппроксимации резольвенты в усреднении операторов четвёртого порядка . . . . . 74
*Пламеневский Б. А., Порецкий А. С.* Система Максвелла в неоднородных анизотропных волноводах с медленной стабилизацией характеристик среды . . . . . 107
*Саранчук Ю. С., Шишкин А. Б.* Общее элементарное решение однородного уравнения типа $q$-сторонней свертки . . . . . 188
*Chapman A.* Symbol length of classes in Milnor $K$-groups . . . . . 214

*The American Mathematical Society scheme for transliteration of Cyrillic may be found at the end of index issues of *Mathematical Reviews*.

St. Petersburg Mathematical Journal VOLUME 34 NUMBER 4 AUGUST 2023

AMS www.ams.org