

St. Petersburg Mathematical Journal

(Formerly Leningrad Mathematical Journal)

Volume 18 Number 1 2007

A Translation of

РОССИЙСКАЯ АКАДЕМИЯ НАУК

АЛГЕБРА И АНАЛИЗ

ТОМ 18 № 1 2006



American Mathematical Society

Providence, Rhode Island USA

ISSN 1061-0022

ST. PETERSBURG MATHEMATICAL JOURNAL

(Formerly Leningrad Mathematical Journal)

A translation of the Russian bimonthly

Алгебра и анализ

“Наука”, С.-Петербургское отделение, 2006 г.

Editorial Board

A. B. Aleksandrov	N. K. Nikol'skiĭ
A. N. Andrianov (Deputy Editor-in-Chief)	A. N. Parshin
V. M. Babich	M. A. Semenov-Tyan-Shanskiĭ
M. Sh. Birman	A. O. Slisenko
V. S. Buslaev	A. L. Smirnov (Executive Secretary)
S. V. Buyalo	A. A. Suslin
O. Ya. Viro	N. N. Ural'tseva
S. V. Kislyakov (Editor-in-Chief)	(Deputy Editor-in-Chief)
P. P. Kulish	V. P. Khavin
N. Yu. Netsvetaev	A. L. Chistov
	A. V. Yakovlev

SUBSCRIPTION INFORMATION. The 2007 subscription is for one volume of six issues. Beginning in 2004, *St. Petersburg Mathematical Journal* is accessible from www.ams.org/journals/. Subscription prices for Volume 18 are US\$1722 list, US\$1378 institutional member. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. For paper delivery, subscribers outside the United States and India must pay a postage surcharge of US\$14; subscribers in India must pay a postage surcharge of US\$23. Expedited delivery to destinations in North America US\$21; elsewhere US\$56. A late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year.

BACK NUMBER INFORMATION. For back issues see www.ams.org/bookstore.

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 02904-2294 USA.

COPYING AND REPRINTING. Material in this journal may be reproduced by any means for educational and scientific purposes without fee or permission with the exception of reproduction by services that collect fees for delivery of documents and provided that the customary acknowledgment of the source is given. This consent does not extend to other kinds of copying for general distribution, for advertising or promotional purposes, or for resale. Requests for permission for commercial use of material should be addressed to the Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. Requests can also be made by e-mail to reprint-permission@ams.org.

St. Petersburg Mathematical Journal is published bimonthly by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 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 02904-2294 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.

© 2007 American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews* and *Zentralblatt MATH*.

This journal is archived in *Portico*.

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.

St. Petersburg Mathematical Journal

(Formerly Leningrad Mathematical Journal)

Volume 18 Number 1 2007

A Translation of

РОССИЙСКАЯ АКАДЕМИЯ НАУК

АЛГЕБРА И АНАЛИЗ

ТОМ 18 № 1 2006



American Mathematical Society

Providence, Rhode Island USA
ISSN 1061-0022

ST. PETERSBURG MATHEMATICAL JOURNAL

(Formerly Leningrad Mathematical Journal)

A translation of the Russian bimonthly

Алгебра и анализ

“Наука”, С.-Петербургское отделение, 2006 г.

Editorial Board

A. B. Aleksandrov	N. K. Nikol'skiĭ
A. N. Andrianov	A. N. Parshin
(Deputy Editor-in-Chief)	M. A. Semenov-Tyan-Shanskiĭ
V. M. Babich	A. O. Slisenko
M. Sh. Birman	A. L. Smirnov
V. S. Buslaev	(Executive Secretary)
S. V. Buyalo	A. A. Suslin
O. Ya. Viro	N. N. Ural'tseva
S. V. Kislyakov	(Deputy Editor-in-Chief)
(Editor-in-Chief)	V. P. Khavin
P. P. Kulish	A. L. Chistov
N. Yu. Netsvetaev	A. V. Yakovlev

SUBSCRIPTION INFORMATION. The 2007 subscription is for one volume of six issues. Beginning in 2004, *St. Petersburg Mathematical Journal* is accessible from www.ams.org/journals/. Subscription prices for Volume 18 are US\$1722 list, US\$1378 institutional member. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. For paper delivery, subscribers outside the United States and India must pay a postage surcharge of US\$14; subscribers in India must pay a postage surcharge of US\$23. Expedited delivery to destinations in North America US\$21; elsewhere US\$56. A late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year.

BACK NUMBER INFORMATION. For back issues see www.ams.org/bookstore.

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 02904-2294 USA.

COPYING AND REPRINTING. Material in this journal may be reproduced by any means for educational and scientific purposes without fee or permission with the exception of reproduction by services that collect fees for delivery of documents and provided that the customary acknowledgment of the source is given. This consent does not extend to other kinds of copying for general distribution, for advertising or promotional purposes, or for resale. Requests for permission for commercial use of material should be addressed to the Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. Requests can also be made by e-mail to reprint-permission@ams.org.

St. Petersburg Mathematical Journal is published bimonthly by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 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 02904-2294 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.

© 2007 American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews* and *Zentralblatt MATH*.

This journal is archived in *Portico*.

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.

CONTENTS

Expository Survey

D. Auckly, L. Kapitanski, and J. M. Speight, Geometry and analysis in nonlinear sigma models	1
--------------------------------------------------------------------------------------------------------------------	---

Research Papers

R. W. Barnard, C. Richardson, and A. Yu. Solynin, A minimal area problem for nonvanishing functions	21
A. I. Generalov, Hochschild cohomology of algebras of quaternion type, I: Generalized quaternion groups	37
S. V. Ivanov and A. I. Nazarov, Weighted Sobolev-type embedding theorems for functions with symmetries	77
G. A. Seregin, New version of the Ladyzhenskaya–Prodi–Serrin condition	89
S. Pott and E. Strouse, Products of Toeplitz operators on the Bergman spaces A_α^2	105
P. de la Harpe, C. Pache, and B. Venkov, Construction of spherical cubature formulas using lattices	119
S. Shimorin, Branching points area theorems for univalent functions	141

RUSSIAN CONTENTS*

Обзоры

<i>Окли Д., Капитанский Л., Спейт Дж. М.</i> Геометрия и анализ в нелинейных сигма-моделях	3
------------------------------------------------------------------------------------------------------	---

Статьи

<i>Barnard R. W., Richardson C., Solynin A. Yu.</i> A minimal area problem for nonvanishing functions	34
<i>Генералов А. И.</i> Когомологии Хохшильда алгебр кватернионного типа. I: Обобщенные группы кватернионов.	55
<i>Иванов С. В., Назаров А. И.</i> О теоремах вложения Соболева с весом для функций с симметриями	108
<i>Серегин Г. А.</i> Новая версия условия Ладыженской–Проди–Серрина	124
<i>Pott S., Strouse E.</i> Products of Toeplitz operators on the Bergman spaces A_α^2	144
<i>de la Harpe P., Pache C., Venkov B.</i> Construction of spherical cubature formulas using lattices	162
<i>Shimorin S.</i> Branching points area theorems for univalent functions	187

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



1061-0022(2007)18:1;1-Y