

# Transactions of the Moscow Mathematical Society

---

2019

---

*A Translation of*

ТРУДЫ  
МОСКОВСКОГО  
МАТЕМАТИЧЕСКОГО  
ОБЩЕСТВА

ТОМ 80, выпуск 1 2019

ТОМ 80, выпуск 2 2019



AMERICAN  
MATHEMATICAL  
SOCIETY

Providence, Rhode Island USA

# TRANSACTIONS OF THE MOSCOW MATHEMATICAL SOCIETY

Translation edited by Frances H. Goldman  
with the assistance of AMS staff

*A translation of*

ТРУДЫ МОСКОВСКОГО МАТЕМАТИЧЕСКОГО ОБЩЕСТВА

## Editorial Board

A. G. Sergeev (Editor in Chief)  
V. M. Buchstaber È. B. Vinberg  
Yu. S. Il'yashenko A. A. Shkalikov  
I. D. Shkredov  
A. V. Domrin (Secretary of the Board)

## Advisory Board

R. A. Minlos S. P. Novikov  
N. Kh. Rozov

Library of Congress Card Number 65-4713

**SUBSCRIPTION INFORMATION.** Transactions of the Moscow Mathematical Society for 2019 will consist of one issue. Beginning in 2004, *Transactions of the Moscow Mathematical Society* is accessible from [www.ams.org/journals/](http://www.ams.org/journals/). The subscription prices for 2019: **Paper format with free electronic access:** List US\$721; AMS Institutional Member US\$576.80; **Electronic only:** List US\$685; AMS Institutional Member US\$548. Subscription renewals are subject to late fees.

See [www.ams.org/journal-faq](http://www.ams.org/journal-faq) for more journal subscription information.

**BACK NUMBER INFORMATION.** For back issues see [www.ams.org/bookstore](http://www.ams.org/bookstore).

Subscriptions and orders should be addressed to 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 St., 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. Request for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information, please visit [www.ams.org/publications/pubpermissions](http://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.)

**Transactions of the Moscow Mathematical Society** (ISSN 0077-1554 (print); ISSN 1547-738X (online)) is published by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA and is mailed from Providence, Rhode Island. Postmaster: Send address changes to Transactions of the Moscow Mathematical Society, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA.

© 2019, American Mathematical Society. All rights reserved.

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

This journal is archived in *Portico*.

The London Mathematical Society is incorporated under Royal Charter and is registered with the Charity Commissioners.

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 24 23 22 21 20 19

# Transactions of the **Moscow** **Mathematical** **Society**

---

2019

---

*A Translation of*

ТРУДЫ  
МОСКОВСКОГО  
МАТЕМАТИЧЕСКОГО  
ОБЩЕСТВА

ТОМ 80, выпуск 1 2019

ТОМ 80, выпуск 2 2019

This translation was prepared jointly by  
the American Mathematical Society  
and the London Mathematical Society



---

AMERICAN  
MATHEMATICAL  
SOCIETY

Providence, Rhode Island USA

# TRANSACTIONS OF THE MOSCOW MATHEMATICAL SOCIETY

Translation edited by Frances H. Goldman  
with the assistance of AMS staff

*A translation of*

ТРУДЫ МОСКОВСКОГО МАТЕМАТИЧЕСКОГО ОБЩЕСТВА

## Editorial Board

A. G. Sergeev (Editor in Chief)  
V. M. Buchstaber È. B. Vinberg  
Yu. S. Il'yashenko A. A. Shkalikov  
I. D. Shkredov  
A. V. Domrin (Secretary of the Board)

## Advisory Board

R. A. Minlos S. P. Novikov  
N. Kh. Rozov

Library of Congress Card Number 65-4713

**SUBSCRIPTION INFORMATION.** Transactions of the Moscow Mathematical Society for 2019 will consist of one issue. Beginning in 2004, *Transactions of the Moscow Mathematical Society* is accessible from [www.ams.org/journals/](http://www.ams.org/journals/). The subscription prices for 2019: **Paper format with free electronic access:** List US\$721; AMS Institutional Member US\$576.80; **Electronic only:** List US\$685; AMS Institutional Member US\$548. Subscription renewals are subject to late fees.

See [www.ams.org/journal-faq](http://www.ams.org/journal-faq) for more journal subscription information.

**BACK NUMBER INFORMATION.** For back issues see [www.ams.org/bookstore](http://www.ams.org/bookstore).

Subscriptions and orders should be addressed to 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 St., 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. Request for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information, please visit [www.ams.org/publications/pubpermissions](http://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.)

**Transactions of the Moscow Mathematical Society** (ISSN 0077-1554 (print); ISSN 1547-738X (online)) is published by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA and is mailed from Providence, Rhode Island. Postmaster: Send address changes to Transactions of the Moscow Mathematical Society, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA.

© 2019, American Mathematical Society. All rights reserved.

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

This journal is archived in *Portico*.

The London Mathematical Society is incorporated under Royal Charter and is registered with the Charity Commissioners.

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 24 23 22 21 20 19

## CONTENTS

S. A. Nazarov, Finite-dimensional approximations to the Poincaré–Steklov operator for general elliptic boundary value problems in domains with cylindrical and periodic exits to infinity .....	1
S. A. Kashchenko, Homogenization over the spatial variable in nonlinear parabolic systems .....	53
S. Yu. Orevkov, Products of conjugacy classes in $SL_2(\mathbb{R})$ .....	73
V. V. Ryzhikov, Weakly homoclinic groups of ergodic actions .....	83
A. G. Sergeev and Kh. A. Khachatryan, On the solvability of a class of nonlinear integral equations in the problem of a spread of an epidemic .....	95
Andrei Andreevich Shkalikov (on his seventieth birthday) .....	113
V. A. Sadovnichii, Ya. T. Sultanaev, and A. M. Akhtyamov, The finiteness of the spectrum of boundary value problems defined on a geometric graph .	123
K. A. Mirzoev and T. A. Safonova, Ordinary differential operators and the integral representation of sums of certain power series .....	133
N. F. Valeev, Ya. T. Sultanaev, and É. A. Nazirova, Spectral Properties of Differential Operators with Oscillating Coefficients .....	153
V. V. Vlasov and N. A. Rautian, Spectral analysis and representation of solutions of integro-differential equations with fractional exponential kernels	169
I. A. Sheipak and T. A. Garmanova, An explicit form for extremal functions in the embedding constant problem for Sobolev spaces .....	189
A. A. Vladimirov, On a class of singular Sturm–Liouville problems .....	211
I. V. Astashova, D. A. Lashin, and A. V. Filinovskii, Control with point observation for a parabolic problem with convection .....	221
A. M. Savchuk and I. V. Sadovnichaya, On the existence of an operator group generated by the one-dimensional Dirac system .....	235
K. D. Cherednichenko, Yu. Yu. Ershova, A. V. Kiselev, and S. N. Naboko, Unified approach to critical-contrast homogenisation with explicit links to time-dispersive media .....	251

## RUSSIAN CONTENTS\*

Труды Московского математического общества

Том 80 (2019), выпуск 1

*С. А. Назаров*

Конечномерные версии оператора Стеклова — Пуанкаре для общих эллиптических краевых задач в областях с цилиндрическими и периодическими выходами на бесконечность 1

*С. А. Каценко*

Усреднение по пространственной переменной в нелинейных параболических системах 63

*С. Ю. Оревкин*

Произведения классов сопряжённости в  $SL_2(\mathbb{R})$  87

*В. В. Рыжиков*

Слабо гомоклинические группы эргодических действий 97

*А. Г. Сергеев, Х. А. Хачатрян*

О разрешимости одного класса нелинейных интегральных уравнений в задаче распространения эпидемии 113

---

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

## Труды Московского математического общества

Том 80 (2019), выпуск 2

- Андрей Андреевич Шкаликов (к семидесятилетию со дня рождения) 133  
*В. А. Садовничий, Я. Т. Султанаев, А. М. Ахтямов*  
О конечности спектра краевых задач, заданных на геометрическом графе 147
- К. А. Мирзоев, Т. А. Сафонова*  
Обыкновенные дифференциальные операторы и интегральное представление сумм некоторых степенных рядов 157
- Н. В. Валеев, Я. Т. Султанаев, Э. А. Назирова*  
Спектральные свойства дифференциальных операторов с осциллирующими коэффициентами 179
- В. В. Власов, Н. А. Раутиан*  
Спектральный анализ и представление решений интегро-дифференциальных уравнений с дробно-экспоненциальными ядрами 197
- И. А. Шейпак, Т. А. Гарманова*  
Явный вид экстремалей в задаче о константах вложения в пространствах Соболева 221
- А. А. Владимиров*  
Об одном классе сингулярных задач Штурма — Лиувилля 247
- И. В. Асташова, Д. А. Лашин, А. В. Филиновский*  
Об управлении с точечным наблюдением для параболической задачи с конвекцией 259
- А. М. Савчук, И. В. Садовничая*  
О существовании операторной группы, порождённой одномерной системой Дирака 275
- К. D. Cherednichenko, Yu. Yu. Ershova, A. V. Kiselev, S. N. Naboko*  
Unified approach to critical-contrast homogenisation with explicit links to time-dispersive media 295

ISSN 0134-8663

Индекс подписки: 84260

Correspondence between *Trudy Moskov. Mat. Obshch.* and *Trans. Moscow Math. Soc.*

Russian	English	Russian	English
<b>12</b> (1963)	<b>1963</b> (1965)	<b>47</b> (1984)	<b>1985</b>
<b>13</b> (1965)	<b>1965</b> (1967)	<b>48</b> (1985)	<b>1986</b>
<b>14</b> (1965)	<b>1965</b> (1967)	<b>49</b> (1986)	<b>1987</b>
<b>15</b> (1966)	<b>1966</b> (1967)	<b>50</b> (1987)	<b>1988</b>
<b>16</b> (1967)	<b>1967</b> (1968)	<b>51</b> (1988)	<b>1989</b>
<b>17</b> (1967)	<b>17</b> (1969)	<b>52</b> (1989)	<b>1990</b>
<b>18</b> (1968)	<b>18</b> (1969)	<b>53</b> (1990)	<b>1991</b>
<b>19</b> (1968)	<b>19</b> (1969)	<b>54</b> (1992)	<b>1993</b>
<b>20</b> (1968)	<b>20</b> (1971)	<b>55</b> (1994)	<b>1994</b>
<b>21</b> (1970)	<b>21</b> (1971)	<b>56</b> (1995)	<b>1995</b>
<b>22</b> (1970)	<b>22</b> (1972)	<b>57</b> (1996)	<b>1996</b>
<b>23</b> (1970)	<b>23</b> (1972)	<b>58</b> (1997)	<b>1997</b>
<b>24</b> (1971)	<b>24</b> (1974)	<b>59</b> (1998)	<b>1998</b>
<b>25</b> (1971)	<b>25</b> (1973)	<b>60</b> (1999)	<b>1999</b>
<b>26</b> (1972)	<b>26</b> (1974)	<b>61</b> (2000)	<b>2000</b>
<b>27</b> (1972)	<b>27</b> (1975)	<b>62</b> (2001)	<b>2001</b>
<b>28</b> (1973)	<b>28</b> (1975)	<b>63</b> (2002)	<b>2002</b>
<b>29</b> (1973)	<b>29</b> (1976)	<b>64</b> (2003)	<b>2003</b>
<b>30</b> (1974)	<b>30</b> (1976)	<b>65</b> (2004)	<b>2004</b>
<b>31</b> (1974)	<b>31</b> (1976)	<b>66</b> (2005)	<b>2005</b>
<b>32</b> (1975)	<b>32</b> (1977)	<b>67</b> (2006)	<b>2006</b>
<b>33</b> (1976)	<b>1978</b> , issue 1	<b>68</b> (2007)	<b>2007</b>
<b>34</b> (1977)	<b>1978</b> , issue 2	<b>69</b> (2008)	<b>2008</b>
<b>35</b> (1976)	<b>1979</b> , issue 1	<b>70</b> (2009)	<b>2009</b>
<b>36</b> (1978)	<b>1979</b> , issue 2	<b>71</b> (2010)	<b>2010</b>
<b>37</b> (1978)	<b>1980</b> , issue 1	<b>72</b> (2011)	<b>2011</b>
<b>38</b> (1979)	<b>1980</b> , issue 2	<b>73</b> (2012)	<b>2012</b>
<b>39</b> (1979)	<b>1981</b> , issue 1	<b>74</b> (2013)	<b>2013</b>
<b>40</b> (1979)	<b>1981</b> , issue 2	<b>75</b> (2014)	<b>2014</b>
<b>41</b> (1980)	<b>1982</b> , issue 1	<b>76</b> (2015)	<b>2015</b>
<b>42</b> (1981)	<b>1982</b> , issue 2	<b>77</b> (2016)	<b>2016</b>
<b>43</b> (1981)	<b>1983</b> , issue 1	<b>78</b> (2017)	<b>2017</b>
<b>44</b> (1982)	<b>1983</b> , issue 2	<b>79</b> (2018)	<b>2018</b>
<b>45</b> (1982)	<b>1984</b> , issue 1	<b>80</b> (2019)	<b>2019</b>
<b>46</b> (1983)	<b>1984</b> , issue 2		







0077-1554(2019)80;1-C