

---

VOLUME 305 NUMBER 1



JANUARY 1988

PAGES 1-430

WHOLE NUMBER 632

---

# T TRANSACTIONS

OF THE

---

A M E R I C A N M A T H E M A T I C A L S O C I E T Y

---

**EDITED BY**

James E. Baumgartner

James W. Cannon

Ralph Cohen

Eugene Fabes

Ronald K. Getoor

Ronald L. Graham, Managing Editor

Jerry L. Kazdan

Roger D. Nussbaum

Carl Pomerance

David J. Saltman

Masamichi Takesaki

Audrey Terras

Robert J. Zimmer

---

PROVIDENCE, RHODE ISLAND USA

ISSN 0002-9947

## TRANSACTIONS OF THE AMERICAN MATHEMATICAL SOCIETY

THIS JOURNAL is devoted entirely to research in pure and applied mathematics, and includes, in general, longer papers than those in the PROCEEDINGS. Papers should be at least 16 typed pages in length.

**PREPARATION OF THE MANUSCRIPT.** All papers should be typewritten double-spaced, and two copies should be sent to the appropriate editor. The author should keep a complete copy. To encourage the submission of manuscripts in electronic form using  $\text{\TeX}$  and the  $\text{\AMS-TeX}$  macro package, the Executive Committee of the Council has adopted a policy that allows for accelerating the publication date of such manuscripts by as much as 20 weeks, which is approximately equal to the time normally needed by the Society for copyediting, typesetting, and proofreading an average manuscript.

**FORM OF MANUSCRIPT.** The first page should consist of a *descriptive title*, followed by an *abstract* which summarizes the article in language suitable for workers in the general field (algebra, analysis, etc.). The *descriptive title* should be short, but informative; useless or vague phrases such as "Some remarks about" or "concerning" should be avoided. Also avoid proper names unless mathematical usage associates them with the work. The *abstract* should be at least one complete sentence, and at most 300 words, with the upper limit primarily for longer papers. Included with the footnotes to your paper, but placed before the first footnote, there should be first the 1980 *Mathematics Subject Classification* (1985 Revision) representing the primary and secondary subjects of the article, which may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. A list of the numbers may be found in the annual subject index of *Mathematical Reviews*, published with the December issue starting in 1984.

**SUBMISSION OF MANUSCRIPT.** See the back of this journal.

**COPYRIGHT TRANSFER AGREEMENT.** The signing of a Copyright Transfer Agreement is a requirement for publication.

**GALLEY PROOF.** When a paper with more than one author has been accepted for publication, only one set of galley proof will be sent. Joint authors should, therefore, indicate on the original manuscript which of them should receive galley proof in the event that the manuscript is accepted for publication.

**BACKLOG.** 100 pages. Two-thirds of the papers currently being accepted by the editors will be published in 10–12 months.

**SUBSCRIPTION INFORMATION.** TRANSACTIONS OF THE AMERICAN MATHEMATICAL SOCIETY is published monthly. Subscription prices for Volumes 305–310 (1988) are \$675 list; \$540 institutional member. A late charge of 10% of the subscription price will be imposed upon orders received from nonmembers after January 1 of the subscription year. Subscribers outside the United States and India must pay a postage surcharge of \$25; subscribers in India must pay a postage surcharge of \$48.

**BACK NUMBER INFORMATION.** Back number prices *per volume* are: for Volumes 78–280, \$99 list, \$79 institutional members; for Volumes 281–286, \$114 list, \$91 institutional members; for Volumes 287–292, \$139 list, \$111 institutional members; for Volumes 293–298, \$155 list, \$124 institutional members; for Volumes 299–304, \$166 list, \$133 institutional members. Volumes 1–77 may be ordered from Johnson Reprint Corporation, 111 Fifth Avenue, New York, New York 10003. Volumes 1–286 may be purchased on microfilm or microfiche from University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan 48106.

---

Subscriptions and orders for publications of the American Mathematical Society should be addressed to American Mathematical Society, P. O. Box 1571, Annex Station, Providence, R. I. 02901-9930. *All orders must be accompanied by payment.* Other correspondence should be addressed to P. O. Box 6248, Providence, R. I. 02940.

TRANSACTIONS of the American Mathematical Society is published monthly by the American Mathematical Society at 201 Charles Street, Providence, R. I. 02904. Second-class postage is paid at Providence, Rhode Island. Postmaster: Send address changes to TRANSACTIONS, American Mathematical Society, P. O. Box 6248, Providence, R. I. 02940.

Copyright © 1988 American Mathematical Society. All rights reserved.

Printed in the United States of America

Information on Copying and Reprinting can be found at the back of this journal.

The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability. ∞

## MEMOIRS OF THE AMERICAN MATHEMATICAL SOCIETY

This bimonthly journal is devoted to research in pure and applied mathematics of much the same nature as appears in TRANSACTIONS. An issue consists of one or more separately bound research tracts for which the author(s) has provided reproduction copy. Prior to 1975 this was published as a monograph series. The editorial committee is identical with that for the TRANSACTIONS so that papers intended for publication in this series should be addressed to one of the editors.

---

### SUBMISSION OF MANUSCRIPT

Two copies of mathematical papers intended for publication in the TRANSACTIONS or the MEMOIRS should be addressed to one of the editors. Subjects, and the editors associated with them, follow.

Ordinary differential equations, partial differential equations, and applied mathematics to ROGER D. NUSSBAUM, Department of Mathematics, Rutgers University, New Brunswick, NJ 08903.

Complex and harmonic analysis to ROBERT J. ZIMMER, Department of Mathematics, University of Chicago, Chicago, IL 60637.

Abstract analysis to MASAMICHI TAKESAKI, Department of Mathematics, University of California, Los Angeles, CA 90024.

Classical analysis to EUGENE FABES, Department of Mathematics, University of Minnesota, Minneapolis, MN 55455.

Algebra, algebraic geometry, and number theory to DAVID J. SALTMAN, Department of Mathematics, University of Texas at Austin, Austin, TX 78713.

Geometric topology and general topology to JAMES W. CANNON, Department of Mathematics, Brigham Young University, Provo, UT 84602.

Algebraic topology and differential topology to RALPH COHEN, Department of Mathematics, Stanford University, Stanford, CA 94305.

Global analysis and differential geometry to JERRY L. KAZDAN, Department of Mathematics, University of Pennsylvania, E1, Philadelphia, PA 19104-6395.

Probability and statistics to RONALD K. GETOOR, Department of Mathematics, University of California at San Diego, La Jolla, CA 92093.

Combinatorics and number theory to CARL POMERANCE, Department of Mathematics, University of Georgia, Athens, GA 30602.

Logic, set theory, and general topology to JAMES E. BAUMGARTNER, Department of Mathematics, Dartmouth College, Hanover, NH 03755.

Automorphic and modular functions and forms, geometry of numbers, multiplicative theory of numbers, zeta and  $L$  functions of number fields and algebras to AUDREY TERRAS, Department of Mathematics, University of California at San Diego, La Jolla, CA 92093.

All other communications to the editors should be addressed to the Managing Editor, RONALD L. GRAHAM, Mathematical Sciences Research Center, AT&T Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974.

### 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 (including abstracts) is permitted only under license from the American Mathematical Society. Requests for such permission should be addressed to the Executive Director, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940.

The appearance of the code on the first page of an article in this journal indicates the copyright owner's consent for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law, provided that the fee of \$1.00 plus \$.25 per page for each copy be paid directly to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, Massachusetts 01970. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

*(Continued from back cover)*

The ideal structure of certain nonselfadjoint operator algebras	
By JUSTIN PETERS.....	333
Operator theoretical realization of some geometric notions	
By LIN QING .....	353
The action of a solvable group on an infinite set never has a unique invariant mean	
By STEFAN KRASA .....	369
A problem in convexity leading to the analysis of two functional equations	
By JOHN V. RYFF .....	377
Interpolation of Besov spaces	
By RONALD A. DEVORE and VASIL A. POPOV .....	397
Finite order solutions of second order linear differential equations	
By GARY G. GUNDERSEN .....	415

# CONTENTS

Vol. 305, No. 1

January 1988

Whole No. 632

Crossed products of continuous-trace $C^*$ -algebras by smooth actions By IAIN RAEBURN and JONATHAN ROSENBERG .....	1
New combinatorial interpretations of Ramanujan's partition congruences mod 5, 7 and 11 By F. G. GARVAN .....	47
A lifting theorem and uniform algebras By TAKAHIKO NAKAZI and TAKANORI YAMAMOTO .....	79
Sharp distortion theorems for quasiconformal mappings By G. D. ANDERSON, M. K. VAMANAMURTHY and M. VUORINEN	95
Euler-Poincaré characteristic and higher order sectional curvature. I By CHUAN-CHIH HSIUNG and KENNETH MICHAEL SHISKOWSKI ..	113
Infinite rank Butler groups By MANFRED DUGAS and K. M. RANGASWAMY .....	129
Coexistence theorems of steady states for predator-prey interacting systems By LIGE LI .....	143
Ensembles de Riesz By VALÉRIE TARDIVEL .....	167
Longtime dynamics of a conductive fluid in the presence of a strong magnetic field By C. BARDOS, C. SULEM and P. L. SULEM .....	175
Isometries between function spaces By KRZYSZTOF JAROSZ and VIJAY D. PATHAK .....	193
On the behavior of harmonic functions near a boundary point By WADE RAMEY and DAVID ULLRICH .....	207
Local projective resolutions and translation functors for Kac-Moody algebras By WAYNE NIEDHARDT .....	221
Representations of hyperharmonic cones By SIRKKA-LIISA ERIKSSON .....	247
Convergence acceleration for generalized continued fractions By PAUL LEVRIE and LISA JACOBSEN .....	263
Complementation in Krein spaces By LOUIS DE BRANGES .....	277
$k$ -dimensional regularity classifications for $s$ -fractals By MIGUEL ANGEL MARTÍN and PERTTI MATTILA .....	293
Counting semiregular permutations which are products of a full cycle and an involution By D. M. JACKSON .....	317

*(Continued on inside back cover)*