

# JOURNAL 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

## **EDITORS**

Michael Artin H. Blaine Lawson, Jr. Richard Melrose Wilfried Schmid Robert E. Tarjan

# ASSOCIATE EDITORS

James G. Arthur
Peter Bickel
Gerd Faltings
Charles L. Fefferman
Michael H. Freedman
Daniel Friedan
Ronald L. Graham
Joe Harris
Hendrik W. Lenstra, Jr.
Andrew Majda
Hugh L. Montgomery
Paul H. Rabinowitz
Karen Uhlenbeck
W. Hugh Woodin

### Journal of the American Mathematical Society

The Journal of the American Mathematical Society has been established for the publication of research articles in all areas of pure and applied mathematics.

### **EDITORS**

Chairman
Michael Artin
Department of Mathematics 2-239
Massachusetts Institute of Technology
Cambridge, MA 02139

H. Blaine Lawson, Jr. Department of Mathematics SUNY at Stony Brook Stony Brook, NY 11794 Wilfried Schmid Department of Mathematics Harvard University Science Center 430 Cambridge, MA 02138

Richard Melrose
Department of Mathematics 2-180
Massachusetts Institute of Technology
Cambridge, MA 02139

Robert E. Tarjan
Department of Computer Science
Princeton University
Princeton, NJ 08544

### ASSOCIATE EDITORS

James G. Arthur, University of Toronto
Peter Bickel, University of California, Berkeley
Gerd Faltings, Princeton University
Charles L. Fefferman, Princeton University
Michael H. Freedman, University of California, San Diego
Daniel Friedan, University of Chicago
Ronald L. Graham, AT & T Bell Laboratories
Joe Harris, Harvard University
Hendrik W. Lenstra, Jr., University of California, Berkeley
Andrew Majda, Princeton University
Hugh L. Montgomery, University of Michigan
Paul H. Rabinowitz, University of Wisconsin
Karen Uhlenbeck, University of Texas at Austin
W. Hugh Woodin, University of California, Berkeley

Subscription information. The Journal of the American Mathematical Society is published quarterly. Subscription prices for Volume 3 (1990) are \$116 list, \$93 institutional member, \$70 individual member. Subscribers outside the United States and India must pay a postage surcharge of \$8; subscribers in India must pay a postage surcharge of \$18.

**Back number information.** Back number prices per volume are: for Volume 1, \$155 list, \$124 institutional member; for Volume 2, \$167 list, \$134 institutional member.

Manuscript submission. See inside back cover.

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. 02901-1571. *All orders must be accompanied by payment*. Other correspondence should be addressed to P.O. Box 6248, Providence, R.I. 02940-6248.

The Journal of the American Mathematical Society is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, R.I. 02904-2213 and is mailed from Providence, Rhode Island. Second class postage is pending at Providence, Rhode Island. Postmaster: Send address changes to Journal of the AMS, American Mathematical Society, P.O. Box 6248, Providence, R.I. 02940-6248.

Copyright © 1990 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.

This publication was typeset using AMS-TEX, the American Mathematical Society's TEX macro system.

Manuscript submission. Manuscripts submitted for publication should either be typewritten double spaced or prepared using  $T_EX$  and the  $A_MS$ - $T_EX$  package. Two copies of the manuscript should be sent directly to one of the Editors. The signing of a Copyright Transfer Agreement is a requirement for publication.

Subject classification. Included with the footnotes to the paper, but placed before the first footnote, the subject classification should represent the primary and secondary subjects of the article. A list may be found in the annual subject index of *Mathematical Reviews*, published with the December issue starting in 1984.

Galley proof. When a paper with more than one author has been accepted for publication, only one set of 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.

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.

1	IOURNAL.	OF THE	AMERIC	AN MATHE	MATICAI	SOCIETY
	IUUNNAL		AWILLI	an wat nin	VIALICAL	

Volume 3, Number 3 July	1990
Horocyclic coordinates for Riemann surfaces and moduli spaces. I: Teichmüller and Riemann spaces of Kleinian groups  IRWIN KRA	499
Complete Kähler manifolds with zero Ricci curvature. I G. TIAN and SHING TUNG YAU	579
$\mathrm{SU}_I(2,F[z,1/z])$ for $F$ a subfield of ${f C}$ DAVID POLLEN	611
A characteristic number for links of surface singularities  JONATHAN WAHL	625
The intrinsic spread of a configuration in ${f R}^d$ Jacob E. Goodman, Richard Pollack, and Bernd Sturmfels	639
Euler's "Exemplum memorabile inductionis fallacis" and q-trinomial coefficients GEORGE E. ANDREWS	653
A pinching theorem for homotopy spheres  KARSTEN GROVE and PETER PETERSEN V	671
The structure of rational and ruled symplectic 4-manifolds  DUSA MCDUFF	679
Harmonic bundles on noncompact curves CARLOS T. SIMPSON	713