## Pacific

## Journal of

 Mathematics
## VOLUME CLII 1992

# PACIFIC JOURNAL OF MATHEMATICS EDITORS 

V. S. Varadarajan
(Managing Editor)
University of California
Los Angeles, CA 90024-1555-05
Herbert Clemens
University of Utah
Salt Lake City, UT 84112
F. Michael Christ

University of California
Los Angeles, CA 90024-1555
Thomas Enright
University of California, San Diego
La Jolla, CA 92093

C. C. Moore

University of California Berkeley, CA 94720
Martin Scharlemann University of California Santa Barbara, CA 93106
Harold Stark
University of California, San Diego La Jolla, CA 92093

ASSOCIATE EDITORS

| R. Arens | E. F. Beckenbach <br> $(1906-1982)$ | B. H. Neumann | F. Wolf <br> $(1904-1989)$ | K. Yoshida |
| :--- | :---: | :---: | :---: | :---: |

SUPPORTING INSTITUTIONS
UNIVERSITY OF ARIZONA
UNIVERSITY OF BRITISH COLUMBIA
CALIFORNIA INSTITUTE OF TECHNOLOGY UNIVERSITY OF CALIFORNIA MONTANA STATE UNIVERSITY
UNIVERSITY OF NEVADA, RENO NEW MEXICO STATE UNIVERSITY OREGON STATE UNIVERSITY

UNIVERSITY OF OREGON UNIVERSITY OF SOUTHERN CALIFORNIA
STANFORD UNIVERSITY UNIVERSITY OF HAWAII UNIVERSITY OF TOKYO UNIVERSITY OF UTAH WASHINGTON STATE UNIVERSITY UNIVERSITY OF WASHINGTON

## CONTENTS

A - ALGEBRA AND NUMBER THEORY
J. Brillhart, Note on the discriminant of certain cyclotomic period polynomials ..... 15
E. B. Burger, Homogeneous Diophantine approximation in $S$ - integers ..... 211
B. Hartley, A general Brauer-Fowler Theorem and centralizers in locally finite groups ..... 101
A. S. Lipson, Some more states models for link invariants ..... 337
M. S. Raghunathan, $A$ note on generators for arithmetic subgroups of algebraic groups ..... 365
C. Scheiderer, Some remarks on orderings under finite field exten- sions ..... 175
M. Tadić, Notes on representations of non-archimedean $\mathrm{SL}(n)$ ..... 375
B - ANALYSIS
B. V. R. Bhat, On a characterization of velocity maps in the space of observables ..... 1
K.-J. Engel, On singular perturbations of second order Cauchy problems ..... 79
M. E. Hoffman, Multiple harmonic series ..... 275
W.-H. Huang, Superharmonicity of curvatures for surfaces of con- stant mean curvature ..... 291
E. Kissin, Indices of unbounded derivations of $C^{*}$-algebras ..... 125
K. B. Laursen, Operators with finite ascent ..... 323
X. Liu, Bloch functions of several complex variables ..... 347
D - GEOMETRY
E. Ballico, On the restrictions of the tangent bundle of the Grass- mannians ..... 201
A. Ferrández and P. Lucas, On surfaces in the 3-dimensional Lorentz-Minkowski space ..... 93
J. Hass, Intersections of least area surfaces ..... 119
G. R. Kempf, Pulling back bundles ..... 319
P. Lucas, See A. Ferrández and P. Lucas
D. Pecker, Sur la projection de variétés algébriques réelles ..... 165
F. Serrano, Elliptic surfaces with an ample divisor of genus two ..... 187

## G - TOPOLOGY

S. R. Costenoble and S. Waner, The equivariant Thom isomor- phism theorem ..... 21
J. J. Dijkstra, J. van Mill, and J. Mogilski, The space of infinite- dimensional compacta and other topological copies of $\left(l_{f}^{2}\right)^{\omega}$. ..... 255
K. H. Dovermann and D. Y. Suh, Smith equivalence for finite abelian groups ..... 41
E. Luft and D. Sjerve, On regular coverings of 3-manifolds by homology 3-spheres ..... 151
J. Mogilski, See J. J. Dijkstra, J. van Mill, and J. MogilskiD. Sjerve, See E. Luft and D. SjerveD. Y. Suh, See K. H. Dovermann and D. Y. SuhJ. van Mill, See J. J. Dijkstra, J. van Mill, and J. MogilskiS. Waner, See S. R. Costenoble and S. Waner

## Pacific Journal of

## Mathematics

B. V. R. Bhat, On a characterization of velocity maps in the space of observables ..... 1
J. Brillhart, Note on the discriminant of certain cyclotomic period polynomials ..... 15
S. R. Costenoble and S. Waner, The equivariant Thom isomorphism theorem ..... 21
K. H. Dovermann and D. Y. Suh, Smith equivalence for finite abelian groups ..... 41
K.-J. Engel, On singular perturbations of second order Cauchy problems ..... 79
A. Ferrández and P. Lucas, On surfaces in the 3-dimensional Lorentz-Minkowski space ..... 93
B. Hartley, A general Brauer-Fowler Theorem and centralizers in locally finite groups ..... 101
J. Hass, Intersections of least area surfaces ..... 119
E. Kissin, Indices of unbounded derivations of $C^{*}$-algebras ..... 125
E. Luft and D. Sjerve, On regular coverings of 3-manifolds by homology 3-spheres ..... 151
D. Pecker, Sur la projection de variétés algébriques réelles ..... 165
C. Scheiderer, Some remarks on orderings under finite field extensions ..... 175
F. Serrano, Elliptic surfaces with an ample divisor of genus two ..... 187

# PACIFIC JOURNAL OF MATHEMATICS <br> EDITORS 

V. S. Varadarajan
(Managing Editor)
University of California
Los Angeles, CA 90024-1555-05
Herbert Clemens
University of Utah
Salt Lake City, UT 84112
F. Michael Christ

University of California
Los Angeles, CA 90024-1555
Thomas Enright
University of California, San Diego
La Jolla, CA 92093

Nicholas'Ercolani
University of Arizona
Tucson, AZ 85721
R. Finn

Stanford University
Stanford, CA 94305
Vaughan F. R. Jones
University of California
Berkeley, CA 94720
Steven Kerckhoff
Stanford University
Stanford, CA 94305
C. C. Moore

University of California
Berkeley, CA 94720
Martin Scharlemann University of California
Santa Barbara, CA 93106
Harold Stark
University of California, San Diego
La Jolla, CA 92093

ASSOCIATE EDITORS

R. Arens<br>E. F. Beckenbach<br>B. H. Neumann<br>F. Wolf<br>K. Yoshida<br>(1906-1982)<br>(1904-1989)

SUPPORTING INSTITUTIONS

UNIVERSITY OF ARIZONA
UNIVERSITY OF BRITISH COLUMBIA
CALIFORNIA INSTITUTE OF TECHNOLOGY UNIVERSITY OF CALIFORNIA MONTANA STATE UNIVERSITY UNIVERSITY OF NEVADA, RENO NEW MEXICO STATE UNIVERSITY OREGON STATE UNIVERSITY

UNIVERSITY OF OREGON
UNIVERSITY OF SOUTHERN CALIFORNIA
STANFORD UNIVERSITY UNIVERSITY OF HAWAII UNIVERSITY OF TOKYO UNIVERSITY OF UTAH WASHINGTON STATE UNIVERSITY UNIVERSITY OF WASHINGTON

The Supporting Institutions listed above contribute to the cost of publication of this Journal, but they are not owners or publishers and have no responsibility for its content or policies.

Mathematical papers intended for publication in the Pacific Journal of Mathematics should be in typed form or offset-reproduced (not dittoed), double spaced with large margins. Please do not use built up fractions in the text of the manuscript. However, you may use them in the displayed equations. Underline Greek letters in red, German in green, and script in blue. The first paragraph must be capable of being used separately as a synopsis of the entire paper. In particular it should contain no bibliographic references. Please propose a heading for the odd numbered pages of less than 35 characters. Manuscripts, in triplicate, may be sent to any one of the editors. Please classify according to the 1991 Mathematics Subject Classification scheme which can be found in the December index volumes of Mathematical Reviews. Supply name and address of author to whom proofs should be sent. All other communications should be addressed to the managing editor, or Elaine Barth, University of California, Los Angeles, California 90024-1555-05.

There are page-charges associated with articles appearing in the Pacific Journal of Mathematics. These charges are expected to be paid by the author's University, Government Agency or Company. If the author or authors do not have access to such Institutional support these charges are waived. Single authors will receive 50 free reprints; joint authors will receive a total of 100 free reprints. Additional copies may be obtained at cost in multiples of 50 .

The Pacific Journal of Mathematics (ISSN 0030-8730) is published monthly except for July and August. Regular subscription rate: $\$ 190.00$ a year ( 10 issues). Special rate: $\$ 95.00$ a year to individual members of supporting institutions.

Subscriptions, orders for numbers issued in the last three calendar years, and changes of address should be sent to Pacific Journal of Mathematics, P.O. Box 969, Carmel Valley, CA 93924, U.S.A. Old back numbers obtainable from Kraus Periodicals Co., Route 100, Millwood, NY 10546.

The Pacific Journal of Mathematics at P.O. Box 969, Carmel Valley, CA 93924 (ISSN 0030-8730) is published monthly except for July and August. Second-class postage paid at Carmel Valley, California 93924, and additional mailing offices. Postmaster: send address changes to Pacific Journal of Mathematics, P.O. Box 969, Carmel Valley, CA 93924.

