CODEN IJMTAW
VOLUME 32
NUMBER 4

PAGES 593–715
WINTER 1988
ISSUE 129

ILLINOIS JOURNAL OF MATHEMATICS

a quarterly journal published by the

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

edited by

GERALD J. JANUSZ
WILLIAM B. JOHNSON
ROBERT KAUFMAN
FRANK B. KNIGHT
A. J. MACINTYRE
DAVID MASSER
PHILIPPE TONDEUR

ILLINOIS JOURNAL OF MATHEMATICS

Manuscript

Original research papers in pure and applied mathematics intended for publication in this journal may be written in English, French or German. They should be addressed to the Illinois Journal of Mathematics, 1409 West Green Street, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, or one of the editors:

GERALD J. JANUSZ (Managing Editor), University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

WILLIAM B.JOHNSON, Texas A & M University, Department of Mathematics, College Station, Texas 77843.

ROBERT KAUFMAN, University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

FRANK B. KNIGHT, University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

A. J. MACINTYRE, University of Oxford, Mathematical Institute, 24-29 St. Giles, Oxford, England OX1 3LB.

DAVID MASSER, The University of Michigan, Department of Mathematics, 3220 Angell Hall, Ann Arbor, Michigan 48109–1003.

PHILIPPE TONDEUR, University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

All papers should be typewritten, double-spaced, and the author should keep a complete copy. Bibliography and footnotes should be typed, double-spaced, on separate sheets of paper. Figures should be drawn separately in black ink on white paper suitable for being photographed. Explain unusual symbols and handwritten symbols, and identify special typefaces such as bold, Gothic (German), script.

Proof

Authors will receive only galley proof. Proof sent to North American addresses will be accompanied by manuscript and sent by first class mail. To other addresses, proof will be sent by airmail, and manuscript will be sent only if requested. Authors are asked to return proof (and manuscript if sent) by the same class of mail that was used in sending it to them.

Page charges

To cover a part of the cost of production, the author's institution will be billed for $40 per page.

Offprints

One hundred free offprints are supplied to the sole author of a paper; fifty free offprints are supplied to each author of a joint paper. Additional offprints may be purchased.

THE ILLINOIS JOURNAL OF MATHEMATICS (ISSN 0019-2082) is published quarterly (Spring, Summer, Fall, Winter) by the University of Illinois Press, 54 E. Gregory Dr., Champaign, IL 61820, on behalf of the Department of Mathematics of the University of Illinois. Second-class postage paid at Champaign, Illinois and additional mailing offices. *Postmaster:* Please send change-of-address notices to University of Illinois Press, 54 E. Gregory Drive, Champaign, Illinois 61820.

Subscription price: $70.00; single issues, $18.00 (volumes 29 to date). Address orders to the University of Illinois Press. Requests for replacement of damaged or undelivered issues will be honored for up to six months after publication of the issue. Back issues of Volumes 1–28 are available from Swets & Zeitlinger B.V., Herreweg 347-b, P.O. Box 810, 2160 SZ Lisse-Holland.

© 1988 by the Board of Trustees of the University of Illinois
Manufactured in the United States of America

VOLUME 32 *1988*

ILLINOIS JOURNAL OF MATHEMATICS

a quarterly journal published by the

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

edited by

GERALD J. JANUSZ

WILLIAM B. JOHNSON

ROBERT KAUFMAN

FRANK B. KNIGHT

A. J. MACINTYRE

DAVID MASSER

PHILIPPE TONDEUR

Pages

AUSLANDER, MAURICE and GREEN E. L., Trace quotient modules . . 534–536

BARCELO, B., KENIG, C. E., RUIZ, A. and SOGGE, C. D., Weighted Sobolev inequalities and unique continuation for the Laplacian plus lower order terms 230–245

BENSON, C. and RATCLIFF, G., Quantization and an invariant for unitary representations of nilpotent Lie groups 53–64

BERGELSON, VITALY and ROSENBLATT, JOSEPH, Mixing actions of groups 65–80

BERTRAND, DANIEL et PHILIPPON, PATRICE, Sous-groupes algébriques de groupes algébriques commutatifs 263–280

CARLSON, JON F. and JONES, ALFREDO, Wild categories of periodic modules 557–561

CARTER, J. SCOTT, Surgery on the equatorial immersion I 703–715

CLIFF, GERALD and WEISS, ALFRED, Moody's induction theorem . . 489–500

COLLINO, ALBERTO, Evidence for a conjecture of Ellingsrud and Stromme on the Chow ring of $\mathrm{Hilb}_d(\mathbf{P}^2)$ 171–210

CORNELL, GARY and ROSEN, MICHAEL, The class group of an absolutely Abelian l-extension 453–461

DE LA PAÑA, J. A. and RAGGI-CÁRDENAS, A., On the global dimension of algebras over regular local rings 520–533

ERDÖS, PAUL and NATHANSON, MELVYN B., Minimal asymptotic bases with prescribed densities 562–574

FONG, CHE-KAO, HERRERO, DOMINGO A. and RODMAN, LEIBA, Invariant subspace lattices that complement every subspace . . 151–158

FRÖHLICH, A., Module defect and factorisablity 407–421

GODEFROY, GILLES and SAPHAR, PIERRE DAVID, Duality in spaces of operators and smooth norms on Banach spaces 672–695

GREEN, E. L. and AUSLANDER, MAURICE, Trace quotient modules 534–536

GREEN, J. A., A theorem on modular endomorphism rings 510–519

GRUENBERG, K. W. and LINNELL, P. A., Minimal free resolutions of lattices over finite groups 361–374

GURALNICK, ROBERT M. and LEVY, LAWRENCE, Presentations of modules when ideals need not be principal 593–653

GUSTAFSON, WILLIAM H. and ROGGENKAMP, KLAUS W., A Mayer-Vietoris sequence for Picard groups, with applications to integral group rings of dihedral and quaternion groups 375–406

HELLER, ALEX, On permutation representations 501–509

HERRERO, DOMINGO A., RODMAN, LEIBA, and FONG, CHE-KAO, Invariant subspace lattices that complement every subspace .. 151–158
HOLLAND, FINBARR and WALSH, DAVID, Hankel operators in Von-Neumann-Schatten classes 1–22
JACOBSON, ELIOT, The permutation index of p-defect zero characters 164–169
JANUSZ, G. J., An inequality in integral representation theory 484–488
JANUSZ, GERALD J., Irving Reiner 1924–1986 315–328
JONES, ALFREDO and CARLSON, JON F., Wild categories of periodic modules 557–561
KEMPF, GEORGE, Hironaka group schemes 159–163
KENIG, C. E., BARCELO, B., RUIZ, A. and SOGGE, C. D., Weighted Sobolev inequalities and unique continuation for the Laplacian plus lower order terms 230–245
KOVACS, AMOS, Products of matrices over a finite field 211–221
KUCHARZ, WOJCIECH, Real algebraic curves and complete intersections 696–702
LAM, T. Y., On the number of solutions of $x^{p^k} = a$ in a p-group .. 575–583
LEVY, LAWRENCE and GURALNICK, ROBERT M., Presentations of modules when ideals need not be principal 593–653
LINNELL, P. A. and GRUENBERG, K. W., Minimal free resolutions of lattices over finite groups 361–374
LUECKING, DANIEL H., Dominating measures for spaces of analytic functions 23–39
MÜLLER, HELMUT, On generalized zeta-functions at negative integers 222–229
NATHANSON, MELVYN B. and ERDÖS, PAUL, Minimal asymptotic bases with prescribed densities 562–574
NEWMAN, MORRIS, An aymptotic result for subgroups of $SL(2, Z)$ of level 2 584–592
PHILIPPON, PATRICE et WALDSCHMIDT, MICHEL, Formes linéaires de logarithmes sur les groupes algébriques commutatifs 281–314
PHILIPPON, PATRICE et BERTRAND, DANIEL, Sous-groupes algébriques de groupes algébriques commutatifs 263–280
RAGGI-CÁRDENAS, A. and DE LA PEÑA, J. A., On the global dimension of algebras over regular local rings 520–533
RATCLIFF, G. and BENSON, C., Quantization and an invariant for unitary representations of nilpotent Lie groups 53–64
ROCAMORA, A. H., Some geometric consequences of the Weitzenbock formula on Riemannian almost-product manifolds; weak harmonic distributions 654–671

RODMAN, LEIBA, FONG, CHE-KAO and HERRERO, DOMINGO A., Invariant subspace lattices that complement every subspace . . 151–158

ROGGENKAMP, KLAUS W. and GUSTAFSON, WILLIAM H., A Mayer-Vietoris sequence for Picard groups, with applications to integral group rings of dihedral and quaternion groups 375–406

ROSEN, MICHAEL and CORNELL, GARY, The class group of an absolutely Abelian l-extension 453–461

ROSENBLATT, JOSEPH and BERGELSON, VITALY, Mixing actions of groups 65–80

RUIZ, A., BARCELO, B., KENIG, C. E. and SOGGE, C. D., Weighted Sobolev inequalities and unique continuation for the Laplacian plus lower order terms 230–245

SAPHAR, PIERRE DAVID and GODEFROY, GILLES, Duality in spaces of operators and smooth norms on Banach spaces 672–695

SIMANCA, SANTIAGO R., A mixed boundary value problem for the Laplacian 98–114

SOGGE, C. D., BARCELO, B., KENIG, C. E. and RUIZ, A., Weighted Sobolev inequalities and unique continuation for the Laplacian plus lower order terms 230–245

SRIVASTAV, ANUPAM, Swan modules and elliptic functions 462–483

SWAN, RICHARD G., Torsion free cancellation over orders 329–360

TAYLOR, M. J., Mordell-Weil groups and the Galois module structure of rings of integers 428–452

ULLOM, STEPHEN V. and WATT, STEPHEN B., Class number restrictions for certain l-extensions of imaginary quadratic fields . . . 422–427

VAN DYKE, FRANCES, Generators and relations for finitely generated graded normal rings of dimension two 115–150

VIGUÉ-POIRRIER, MICHELINE, Sur l'algèbre de cohomologie cyclique d'un espace l-connexe applications à la géométrie des variétés 40–52

WALDSCHMIDT, MICHEL et PHILIPPON, PATRICE, Formes linéaires de logarithmes sur les groupes algébriques commutatifs 281–314

WALSH, DAVID and HOLLAND, FINBARR, Hankel operators in Von-Neumann-Schatten classes 1–22

WATT, STEPHEN B. and ULLOM, STEPHEN V., Class number restrictions for certain l-extensions of imaginary quadratic fields . . . 422–427

WEISS, ALFRED and CLIFF, GERALD, Moody's induction theorem . . 489–500

WIEGAND, ROGER, Nilpotent elements in Grothendieck rings 246–262

YUKICH, J. E., Convergence rates for functions classes with applications to the empirical characterization function 81–97