

VOLUME 39 Number 4

# ILLINOIS JOURNAL OF MATHEMATICS

---

a quarterly journal published by the  
**UNIVERSITY OF ILLINOIS**  
at Urbana-Champaign

edited by

STEPHANIE ALEXANDER  
EARL R. BERKSON  
E. GRAHAM EVANS, JR.  
ADOLF HILDEBRAND  
MAUNG MIN-OO  
LOU VAN DEN DRIES  
JANG-MEI WU

WINTER 1995 Pages 531-754

## 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. The submission of a paper implies the author's assurance that it has not been published or submitted for publication elsewhere. Manuscripts should be addressed to the Illinois Journal of Mathematics, 1409 West Green Street, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801 (e-mail [ijm@math.uiuc.edu](mailto:ijm@math.uiuc.edu)) or one of the editors:]

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

EARL R. BERKSON, University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

E. GRAHAM EVANS, JR. (Managing Editor), University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

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

MAUNG MIN-OO, McMaster University, Department of Mathematics and Statistics, 1280 Main St. West, Hamilton, Ontario, Canada L8S 4K1.

LOU VAN DEN DRIES, University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

JANG-MEI WU, University of Illinois, Department of Mathematics, 273 Altgeld Hall, 1409 West Green St., Urbana, Illinois 61801.

*Continued on inside back cover*

---

THE ILLINOIS JOURNAL OF MATHEMATICS (ISSN 0019-2082) is published quarterly (Spring, Summer, Fall, Winter) by the University of Illinois Press, 1325 S. Oak, 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 the University of Illinois Press.

---

Subscription price: \$108; single issues, \$27 (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.

---

© 1995 by the Board of Trustees of the University of Illinois  
Manufactured in the United States of America

VOLUME 39      1995

# ILLINOIS JOURNAL OF MATHEMATICS

---

a quarterly journal published by the  
**UNIVERSITY OF ILLINOIS**  
at Urbana-Champaign

edited by

STEPHANIE ALEXANDER  
EARL R. BERKSON  
E. GRAHAM EVANS, JR.  
ADOLF HILDEBRAND  
MAUNG MIN-OO  
LOU VAN DEN DRIES  
JANG-MEI WU



	Pages
AGRAWAL, SANJEEV and SINGH, DINESH, De Branges spaces contained in some Banach spaces of analytic functions . . . . .	351–357
ALBERT, MICHAEL H. and PATRICK, DAVID, Free groups and unification in $\mathfrak{A}_m \mathfrak{A}_2$ . . . . .	407–415
ALEXANDER, J. RALPH, BLAIR, CHARLES E. and RUBEL, LEE A., Approximate versions of Cauchy's functional equation . . . . .	278–287
ALTSCHULER, STEVEN J., A geometric heat flow for one-forms on three dimensional manifolds. . . . .	98–118
BEATROUS, FRANK and LI, SONG-YING, Trace ideal criteria for operators of Hankel type . . . . .	723–754
BEAUCOUP, FRANCK, Minimizing norms of polynomials under constraints on the distribution of the zeros . . . . .	491–507
BEAUZAMY, BERNARD, A generalized Jensen's inequality for bounded analytic functions. . . . .	196–203
BELLOUT, HAMID, On a special Schauder basis for the Sobolev spaces $W_0^{1,p}(\Omega)$ . . . . .	187–195
BLAIR, CHARLES E., RUBEL, LEE A. and ALEXANDER, RALPH J., Approximate versions of Cauchy's functional equation . . . . .	278–287
BOARDMAN, MICHAEL E., Relative spectra in complete lmc-algebras with applications . . . . .	119–139
BONOME, A., CASTRO, R., GARCÍA-RÍO, E., HERVELLA, L. M. and MATSUSHITA, Y., Null holomorphically flat indefinite almost Hermitian manifolds . . . . .	635–660
CARSON, ANDREW B., A characterization of twisted function rings . .	1–14
CASCANTE, CARME and ORTEGA, JOAQUÍN M., Tangential-excep-tional sets for Hardy-Sobolev spaces . . . . .	68–85
CASTRO, R., GARCÍA-RÍO, E., HERVELLA, L. M., MATSUSHITA, Y. and BONOME, A., Null holomorphically flat indefinite almost Hermitian manifolds . . . . .	635–660
CHAN, SHIH-PING and LIM, CHONG-HAI, The associated orders of rings of integers in Lubin-Tate division fields over the $p$ -adic number field . . . . .	30–38
CUTLER, COLLEEN D., The density theorem and Hausdorff inequality for packing measure in general metric spaces . . . . .	676–694
DAVIDOV, JOHANN, MUŠKAROV, OLEV and GRANTCHAROV, GUEO, Kähler curvature identities for twistor spaces. . . . .	627–634
DE CARLI, LAURA and IOSEVICH, ALEX, A restriction theorem for flat manifolds of codimension two. . . . .	576–585

## CONTENTS

DEFANT, MARTIN and JUNGE, MARIUS, How many vectors are needed to compute $(p, q)$ -Summing norms . . . . .	661–675
FREMLIN, D. H., The Generalized McShane integral . . . . .	39–67
FRIEDLANDER, J. B. and GOLDSTON, D. A., Some singular series averages and the distribution of Goldbach numbers in short intervals . . . . .	158–180
GARCÍA-RÍO, E., HERVELLA, L. M., MATSUSHITA, Y., BONOME, A. and CASTRO, R., Null holomorphically flat indefinite almost Hermitian manifolds . . . . .	635–660
GARDINER, STEPHEN J., Tangential harmonic approximation on relatively closed sets . . . . .	143–157
GETHNER, ELLEN, Rational period functions on $G(\sqrt{2})$ and $G(\sqrt{3})$ with hyperbolic poles are not Hecke eigenfunctions . . . . .	695–722
GOLDSTEIN, JEROME A. and NAGY, BELA, An extremal property of contraction semigroups in Banach spaces . . . . .	441–449
GOLDSTON, D. A. and FRIEDLANDER, J. B., Some singular series averages and the distribution of Goldbach numbers in short intervals . . . . .	158–180
GRANTCHAROV, GUEO, MUŠKAROV, OLEG and DAVID, JOHANN, Kähler curvature identities for twistor spaces . . . . .	627–634
GUERRE-DELABRIERE, SYLVIE, $L_p$ -regularity of the Cauchy problem and the geometry of Banach spaces . . . . .	556–566
HERVELLA, L. M., MATSUSHITA, Y., BONOME, A. and CASTRO, R., GARCÍA-RÍO, E., Null holomorphically flat indefinite almost Hermitian manifolds . . . . .	635–660
HO, LOP-HING, Closed range property of $\bar{\partial}$ on nonpseudoconvex domains . . . . .	86–97
HU, ZHIGUO, On the set of topologically invariant means on the Von Neumann algebra $VN(G)$ . . . . .	463–490
IOSEVICH, ALEX and DE CARLI, LAURA, A restriction theorem for flat manifolds of codimension two . . . . .	576–585
JACO, WILLIAM and TOLLEFSON, JEFFREY, L., Algorithms for the complete decomposition of a closed 3-manifold . . . . .	358–406
JAMESON, G.J.O., The number of elements required to determine $(p, 1)$ -summing norms . . . . .	251–257
JARCHOW, HANS and RIEDL, REINHARD, Factorization of composition operators through Bloch type spaces . . . . .	431–440
JUNGE, MARIUS and DEFANT, MARTIN, How many vectors are needed to compute $(p, q)$ -Summing norms . . . . .	661–675

CONTENTS

KAN, CHARN-HUEN, Norm structure functions and extremeness criteria for operators on $L_p$ ( $p \leq 1$ ) or intp $C(K)$ . . . . .	531–555
KOCHNEFF, E., The Riesz transforms of the Gaussian . . . . .	140–142
KRANTZ, STEVEN G. and LI, SONG-YING, Some remarks on the corona problem on strongly pseudoconvex domains in $\mathbf{C}^n$ . . . . .	323–349
LANCIEN, FLORENCE, Distribution of functions in abstract $H^1$ . . . . .	181–186
LAWLOR, GARY R. and MURDOCH, TIMOTHY A., A note about the Veronese cone . . . . .	271–277
LEUNG, DENNY H., On $c_0$ -saturated Banach spaces . . . . .	15–29
LEWIS, JAMES D., A generalization of Mumford's theorem, II . . . . .	288–304
LI, SONG-YING and BEATROUS, FRANK, Trace ideal criteria for operators of Hankel type . . . . .	723–754
LI, SONG-YING and KRANTZ, STEVEN G., Some remarks on the corona problem on strongly pseudoconvex domains in $\mathbf{C}^n$ . . . . .	323–349
LIM, CHONG-HAI and CHAN, SHIH-PING, The associated orders of rings of integers in Lubin-Tate division fields over the $p$ -adic number field . . . . .	30–38
MATHERON, ETIENNE, The descriptive complexity of Helson sets . . . . .	608–626
MATSUSHITA, Y., BONOME, A., CASTRO, R., GARCÍA-RÍO, E. and HERVELLA, L. M., Null holomorphically flat indefinite almost Hermitian manifolds . . . . .	635–660
MEYER, MICHAEL J., Lower bounds for norms on certain algebras . . . . .	567–575
MIQUEL, VICENTE and PALMER, VICENTE, Lower bounds for the mean curvature of hollow tubes around complex hypersurfaces and totally real submanifolds . . . . .	508–530
MURDOCH, TIMOTHY A. and LAWLOR, GARY R., A note about the Veronese cone . . . . .	271–277
MUŠKAROV, OLEG, DAVID, JOHANN and GRANTCHAROV, GUEO, Kähler curvature identities for twistor spaces . . . . .	627–634
NAGY, BELA and GOLDSTEIN, JEROME A., An extremal property of contraction semigroups in Banach spaces . . . . .	441–449
NICOLAS, J. L. and SÁRKÖZY A., On the parity of partition functions . . . . .	586–597
ORTEGA, JOAQUÍN M. and CASCANTE, CARME, Tangential-excep-tional sets for Hardy-Sobolev spaces . . . . .	68–85
PALMER, VICENTE and MIQUEL, VICENTE, Lower bounds for the mean curvature of hollow tubes around complex hypersurfaces and totally real submanifolds . . . . .	508–530
PATRICK, DAVID and ALBERT, MICHAEL H., Free groups and unification in $\mathfrak{A}_m\mathfrak{A}_2$ . . . . .	407–415

## CONTENTS

QIU, JAMES ZHIJIAN, Boundary values of analytic functions in the Banach space $P^t(\sigma)$ on crescents . . . . .	305–322
RANDRIANANTOANINA, NARCISSE and SAAB, ELIAS, Stability of some types of Radon-Nikodym properties . . . . .	416–430
RAYNAUD, YVES, Complemented Hilbertian subspaces in rearrangement invariant function spaces . . . . .	212–250
RIEDL, REINHARD and JARCHOW, HANS, Factorization of composition operators through Bloch type spaces . . . . .	431–440
RUBEL, LEE A., ALEXANDER, RALPH J. and BLAIR, CHARLES E., Approximate versions of Cauchy's functional equation . . . . .	278–287
RUBEL, LEE A., Correction to my paper "Closed-form solutions of some partial differential equations via quasi-solutions II" . . . . .	350
RUBEL, LEE A. and YANG, CHUNG-CHUN, The factorization of $A(z) + B(w)$ under composition . . . . .	258–270
SAAB, ELIAS and RANDRIANANTOANINA, NARCISSE, Stability of some types of Radon-Nikodym properties . . . . .	416–430
SÁRKÖZY, A. and NICOLAS, J. L., On the parity of partition functions . . . . .	586–597
and SINGH, DINESH and AGRAWAL, SANJEEV, De Branges spaces contained in some Banach spaces of analytic functions . . . . .	351–357
THOMAS, ANTHONY D., Uniform extendibility of the Bergman kernel . . . . .	598–607
TOLLEFSON, JEFFREY, L. and JACO, WILLIAM, Algorithms for the complete decomposition of a closed 3-manifold . . . . .	358–406
VAN DEN DRIES, Parametrizing the solutions of an analytic differential equation . . . . .	450–462
YANG, CHUNG-CHUN and RUBEL, LEE A., The factorization of $A(z) + B(w)$ under composition . . . . .	258–270
YANG, DAGANG, A note on conformal vector fields and positive curvature . . . . .	204–211