

# PROCEEDINGS

OF THE

## AMERICAN MATHEMATICAL SOCIETY

EDITED BY

FRED G. BRAUER

JACOB FELDMAN

GLEN E. BREDON

JOSEPH J. ROTMAN

W. WISTAR COMFORT

LEE A. RUBEL

GEORGE B. SELIGMAN

WITH THE COOPERATION OF

JAMES D. KUELBS

ALLEN L. SHIELDS

ROBERT I. SOARE

Coden: PAMYAR

Pages 317-651

Volume 31

February 1972

Number 2

Whole No. 152

*Published by the*

AMERICAN MATHEMATICAL SOCIETY

PROVIDENCE, RHODE ISLAND

# Proceedings of the American Mathematical Society

THIS JOURNAL is devoted entirely to research in pure and applied mathematics, and the publication of original papers of moderate length. The maximum length of an acceptable paper is about 8 printed pages. Since a page of the PROCEEDINGS contains about 400 words, a rule of thumb is that under 10 typed pages is probably within the limit, but that over 12 typed pages is probably too long.

**SHORTER NOTES.** Very short notes not to exceed 1 printed page of an unusual nature are also accepted, and appear under the heading SHORTER NOTES. Items deemed suitable include an elegant new proof of an important and well-known theorem, an illuminating example or counterexample, or a new viewpoint on familiar results. New results, if of a brief and striking character, might also be acceptable, though in general a paper which is merely very short will not be suitable for the SHORTER NOTES department.

**PREPARATION OF THE MANUSCRIPT.** Articles for insertion should be typewritten and double spaced. Ditto is not generally satisfactory, although other modes of multiple reproduction may be. The *Manual for Authors*, available from the Society, should be consulted for symbols and style conventions. Authors should take the greatest possible care in preparing the original manuscript. Hand drawn symbols are satisfactory, if clearly done; directions to the printer should be included where necessary on a separate sheet, not in the accompanying letter. Authors must keep a complete copy of their manuscript, and editors will acknowledge receipt; manuscripts can therefore be sent by ordinary mail and any other kind (registered, certified) is entirely unnecessary. Submission of two copies of the manuscript is helpful, but by no means necessary.

**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 150 words. Included with the footnotes to your paper, but placed before the first footnote, there should be first the AMS (MOS) *subject classification numbers* representing the primary and secondary subjects of the article. This may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. The AMS (MOS) Subject Classification Scheme (1970) with instructions for its use can be found as an appendix to *Mathematical Reviews, Index to Volume 39* (June 1970). See the June 1970 Notices for more details, as well as illustrative examples.

**SUBMISSION OF MANUSCRIPTS, REPRINTS AND ADDRESS CHANGES.** See the last page of this issue.

**SUBSCRIPTION INFORMATION.** Five volumes are planned for 1972; the subscription price is \$100. Back number prices are as follows: Volumes 1-16, \$14 per volume; Volumes 17-19, \$18 per volume; Volumes 20-26, \$30 per volume; Volumes 27-30, \$27 per volume.

THE PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY is published monthly. Subscriptions, orders for back numbers and inquiries in regard to nondelivery of current numbers should be addressed to the American Mathematical Society, P.O. Box 6248, Providence, R.I. 02904.

Second-class postage paid at Providence, Rhode Island, and additional mailing offices.

Copyright © American Mathematical Society 1972  
Printed in the United States of America

## AMS (MOS) MAJOR SUBJECT HEADINGS (1970)

The letters in parentheses indicate groupings which are used in the table of contents of each issue and in the volume index.

<p>00 (H) General</p> <p>01 (H) History and Biography</p> <p>02 (E) Logic and Foundations</p> <p>04 (E) Set Theory</p> <p>05 (A) Combinatorics</p> <p>06 (A) Order, Lattices, Ordered Algebraic Structures</p> <p>08 (A) General Mathematical Systems</p> <p>10 (A) Number Theory</p> <p>12 (A) Algebraic Number Theory, Field Theory and Polynomials</p> <p>13 (A) Commutative Rings and Algebras</p> <p>14 (A) Algebraic Geometry</p> <p>15 (A) Linear and Multilinear Algebra, Matrix Theory (finite and infinite)</p> <p>16 (A) Associative Rings and Algebras</p> <p>17 (A) Nonassociative Rings and Algebras</p> <p>18 (A) Category Theory, Homological Algebra</p> <p>20 (A) Group Theory and Generalizations</p> <p>22 (G) Topological Groups, Lie Groups</p> <p>26 (B) Real Functions</p> <p>28 (B) Measure and Integration</p> <p>30 (B) Functions of a Complex Variable</p> <p>31 (B) Potential Theory</p> <p>32 (B) Several Complex Variables and Analytic Spaces</p> <p>33 (B) Special Functions</p> <p>34 (B) Ordinary Differential Equations</p> <p>35 (B) Partial Differential Equations</p> <p>39 (B) Finite Differences and Functional Equations</p> <p>40 (B) Sequences, Series, Summability</p> <p>41 (B) Approximations and Expansions</p> <p>42 (B) Fourier Analysis</p> <p>43 (B) Abstract Harmonic Analysis</p>	<p>44 (B) Integral Transforms, Operational Calculus</p> <p>45 (B) Integral Equations</p> <p>46 (B) Functional Analysis</p> <p>47 (B) Operator Theory</p> <p>49 (B) Calculus of Variations and Optimal Control</p> <p>50 (D) Geometry</p> <p>52 (D) Convex Sets and Geometric Inequalities</p> <p>53 (D) Differential Geometry</p> <p>54 (G) General Topology</p> <p>55 (G) Algebraic Topology</p> <p>57 (G) Manifolds and Cell Complexes</p> <p>58 (G) Global Analysis, Analysis on Manifolds</p> <p>60 (F) Probability Theory and Stochastic Processes</p> <p>62 (F) Statistics</p> <p>65 (C) Numerical Analysis</p> <p>68 (C) Computer Science</p> <p>70 (C) Mechanics of Particles and Systems</p> <p>73 (C) Mechanics of Solids</p> <p>76 (C) Fluid Mechanics</p> <p>78 (C) Optics, Electromagnetic Theory</p> <p>80 (C) Classical Thermodynamics, Heat Transfer</p> <p>81 (C) Quantum Mechanics</p> <p>82 (C) Statistical Physics, Structure of Matter</p> <p>83 (C) Relativity</p> <p>85 (C) Astronomy and Astrophysics</p> <p>86 (C) Geophysics</p> <p>90 (C) Economics, Operations Research, Programming, Games</p> <p>92 (C) Biology and Behavioral Sciences</p> <p>93 (C) Systems, Control</p> <p>94 (C) Information and Communication, Circuits, Automata</p> <p>96 (H) Mathematical Education, Elementary</p> <p>97 (H) Mathematical Education, Secondary</p> <p>98 (H) Mathematical Education, Collegiate</p>
---	--

# INDEX TO VOLUME 31

## SUBJECT INDEX

\*Starred items are "Shorter Notes"

### A. ALGEBRA AND NUMBER THEORY

#### 05. Combinatorics

Ummel, Brian R. *Some examples relating the deleted product of imbeddability*, 307.

#### 06. Order, Lattices, Ordered Algebraic Structures

DeMarr, Ralph and Steger, Arthur. *On elements with negative squares*, 57.

Glass, A. M. W. *Which abelian groups can support a directed, interpolation order?*, 395.

Hall, Japheth, Jr. *The independence of certain axioms of structures in sets*, 317.

Johnson, Johnny A. *Union conditions in Noether lattices*, 391.

Metcalfe, F. T. and Payne, T. H. *On the existence of fixed points in a totally ordered set*, 441.

Steinberg, Stuart A. *An embedding theorem for commutative lattice-ordered domains*, 409.

Subramanian, H. *Principal ideals in the ideal lattice*, 445.

#### 08. General Mathematical Systems

Hall, Japheth, Jr. *The independence of certain axioms of structures in sets*, 317.

#### 10. Number Theory

Apostol, Tom M. *Dirichlet L-functions and primitive characters*, 384.

Berndt, Bruce C. *The functional equation of some Dirichlet series*. II, 24.

\*Sato, Daihachiro. *Algebraic solution of  $x^y = y^x$  ( $0 < x < y$ )*, 316.

#### 12. Algebraic Number Theory, Field Theory and Polynomials

Boyd, David W. and Kisilevsky, H. *On the exponent of the ideal class groups of complex quadratic fields*, 433.

Brown, Ezra. *The class number of  $Q(\sqrt{-p})$ , for  $p \equiv 1 \pmod{8}$  a prime*, 381.

Cozzens, John and Johnson, Joseph. *Some applications of differential algebra to ring theory*, 354.

Eakin, Paul. *A note on finite dimensional subrings of polynomial rings*, 75.

Fredman, M. L. *The distribution of absolutely irreducible polynomials in several indeterminates*, 387.

Mordeson, J. N. and Vinograd, B. *Separating  $p$ -bases and transcendental extension fields*, 417.

Thaler, A. I. *A nonarchimedean theory of analytic continuation in several variables*, 61.

#### 13. Commutative Rings and Algebras

Brewer, James W. and Rutter, Edgar A. *A note on finitely generated ideals which are locally principal*, 429.

Brown, David E. and Larsen, Max D. *Separation of nonassociates by valuations*, 326.

Lu, Chin-Pi. *A generalization of Mori's theorem*, 373.

Ogus, Arthur and Bergman, George. *Nakayama's Lemma for half-exact functors*, 67.

Roggenkamp, Klaus W. *An extension of the Noether-Deuring theorem*, 423.

Subramanian, H. *Principal ideals in the ideal lattice*, 445.

**14. Algebraic Geometry**

Ogus, Arthur and Bergman, George. *Nakayama's Lemma for half-exact functors*, 67.

**15. Linear and Multilinear Algebras; Matrix Theory (finite and infinite)**

Gibson, P. M. *Localization of the zeros of the permanent of a characteristic matrix*, 18.

Jones, John, Jr. *Solution of certain matrix equations*, 333.

Merris, Russell and Pierce, Stephen. *Monotonicity of positive semidefinite hermitian matrices*, 437.

Osborn, Howard. *Representations of Euler classes*, 340.

Plemmons, R. J. and Cline, R. E. *The generalized inverse of a nonnegative matrix*, 46.

**16. Associative Rings and Algebras**

Beauregard, Raymond A. *Localization in a principal right ideal domain*, 21.

Bruning, L. M. and Leavitt, W. G. *Erratum to "Minimal generating sets for free modules"*, 638.

Cozzens, John and Johnson, Joseph. *Some applications of differential algebra to ring theory*, 354.

Eakin, Paul. *A note on finite dimensional subrings of polynomial rings*, 75.

Golan, Jonathan S. *Characterization of rings using quasiprojective modules*. III, 401.

Lewin, Jacques. *A note on zero divisors in group-rings*, 357.

Miller, Robert W. and Turnidge, Darrell R. *Morita duality for endomorphism rings*, 91.

Montgomery, Susan. *Algebraic algebras with involution*, 368.

Newman, Kenneth. *Constructing sequences of divided powers*, 32

Passman, D. S. *Minimal ideals in group rings*, 81.

———. *Group rings satisfying a polynomial identity*. III, 87.

Roggenkamp, Klaus W. *An extension of the Noether-Deuring theorem*, 423.

Sandomierski, F. L. *Modules over the endomorphism ring of a finitely generated projective module*, 27.

Steinberg, Stuart A. *An embedding theorem for commutative lattice-ordered domains*, 409.

Stewart, Patrick N. *Divinsky's radical*, 347.

**17. Nonassociative Rings and Algebras**

Chaffer, Robert A. *On algebras satisfying the identity  $(yx)x + x(xy) = 2(xy)x$* , 376.

Gross, Fletcher. *Finite automorphic algebras over  $\text{GF}(2)$* , 10.

Myung, Hyo Chul. *A note on Lie-admissible nilalgebras*, 95.

Scribner, D. R. *The Lie algebra of the structure group of a power-associative algebra*, 363.

**18. Category Theory, Homological Algebra**

Elman, Richard and Lam, T. Y. *Determination of  $k_n$  ( $n \geq 3$ ) for global fields*, 427.

**20. Group Theory and Generalizations**

Chein, Orin. *Induced automorphisms of free metabelian groups*, 1.

Gupta, C. K. and Gupta, N. D. *On groups of exponent four*. II, 360.

Newman, Morris. *2-generator groups and parabolic class numbers*, 51.

Schacher, Murray M. *More on the Schur subgroup*, 15.

Stringall, Robert W. *Primary modules determined by indecomposable idempotent endomorphisms*, 54.

Wong, James C. S. *Invariant means on locally compact semigroups*, 39.

## B. ANALYSIS

**28. Measure and Integration**

Gowrisankaran, Kohur. *Measurability of functions in product spaces*, 485.

\*Ramachandran, D. *A note on finitely additive set functions*, 314.

**30. Functions of a Complex Variable**

Duren, P. L. and Shapiro, H. S. *Interpolation in  $H^p$  spaces*, 162.

Jenkins, James A. *A remark on "pairs" of regular functions*, 119.

Miller, James. *Starlike meromorphic functions*, 446.

Srivastava, H. M. *Remark on some integrals involving products of Whittaker functions*, 133.

**31. Potential Theory**

Nakai, Mitsuru and Sario, Leo. *Quasiharmonic classification of Riemannian manifolds*, 165.

**32. Several Complex Variables and Analytic Spaces**

Jacowicz, Chester Alan. *A nonprincipal invariant subspace of the Hardy space on the torus*, 127.

**33. Special Functions**

Srivastava, H. M. *Remark on some integrals involving products of Whittaker functions*, 133.

Srivastava, H. M. and Singhal, J. P. *Some extensions of the Mehler formula*, 135.

**34. Ordinary Differential Equations**

Etgen, Garret J. *A note on two point boundary problems for nonlinear matrix differential systems*, 213.

Fennell, R. E. and Proctor, T. G. *On asymptotic behavior of perturbed nonlinear systems*, 499.

Haddock, John R. *A remark on a stability theorem of M. Marachkoff*, 209.

Kreith, Kurt. *A Prüfer transformation for nonselfadjoint systems*, 147.

Proctor, T. G. *Periodic solutions for perturbed nonlinear differential equations. II*, 219.

\*Ristroph, Robert. *Pólya's Property W and factorization—A short proof*, 631.

Seifert, George. *On almost periodic solutions for undamped systems with almost periodic forcing*, 104.

Travis, Curtis C. *Oscillation theorems for second-order differential equations with functional arguments*, 199.

Zauderer, Erich. *A uniform asymptotic turning point theory for second order linear ordinary differential equations*, 489.

Zettl, Anton. *Factorization and disconjugacy of third order differential equations*, 203.

**35. Partial Differential Equations**

Coffman, Charles V. *On the bifurcation theory of semilinear elliptic eigenvalue problems*, 170.

Greenfield, Stephen J. *Hypoelliptic vector fields and continued fractions*, 115.

Greenfield, Stephen J. and Wallach, Nolan R. *Global hypoellipticity and Liouville numbers*, 112.

**39. Finite Differences and Functional Equations**

Buck, R. C. *On the functional equation  $\phi(x) = g(x)\phi(\beta(x)) + u(x)$* , 159.

**40. Sequences, Series, Summability**

Diamond, Harold G. *On a tauberian theorem of Wiener and Pitt*, 152.

**41. Approximations and Expansions**

Shuchat, Alan H. *Approximation of vector-valued continuous functions*, 97.

**42. Fourier Analysis**

- Greenfield, Stephen J. *Hypoelliptic vector fields and continued fractions*, 115.  
 Greenfield Stephen J. and Wallach, Nolan R. *Global hypoellipticity and Liouville numbers*, 112.  
 Kanter, Marek. *A representation theorem for  $L^p$  spaces*, 472.  
 Mandrekar, V. and Salehi, H. *On a factorization theorem of D. Lowdenslager*, 185.  
 Moore, Berrien III, *Erratum to "The Szegő infimum"*, 638.  
 Newman, D. J. *A new  $l_1$  estimate and a problem of Katznelson*, 225.  
 Wong, James C. S. *Invariant means on locally compact semigroups*, 39.

**43. Abstract Harmonic Analysis**

- \*Bachelis, G. F., Parker, W. A. and Ross, K. A. *Local units in  $L^1(G)$* , 312.  
 Dunkl, Charles F. and Ramirez, Donald E. *Bounded projections on Fourier-Stieltjes transforms*, 122.  
 Greenfield, Stephen J. *Hypoelliptic vector fields and continued fractions*, 115.  
 Greenfield Stephen J. and Wallach, Nolan R. *Global hypoellipticity and Liouville numbers*, 112.  
 Renaud, P. F. *Equivalent types of invariant means on locally compact groups*, 495.  
 Salehi, Habib. *Stone's theorem for a group of unitary operators over a Hilbert space*, 480.

**44. Integral Transforms, Operational Calculus**

- Srivastava, H. M. *Remark on some integrals involving products of Whittaker functions*, 133.

**45. Integral Equations**

- Clancey, Kevin. *On the smoothness of eigenfunctions of hyponormal singular integral operators*, 475.  
 Nelson, Paul, Jr. *Positive solutions of positive linear equations*, 453.

**46. Functional Analysis**

- Davis, William J. and Lindenstrauss, Joram. *On total nonnorming subspaces*, 109.  
 Jacewicz, Chester Alan. *A nonprincipal invariant subspace of the Hardy space on the torus*, 127.  
 Kanter, Marek. *A representation theorem for  $L^p$  spaces*, 472.  
 Lal, Nand and Merrill, Samuel III, *Isometries of  $H^p$  spaces of the torus*, 465.  
 Lewis, D. R. *Spaces on which each absolutely summing map is nuclear*, 195.  
 Malviya, B. D. and Tomiuk, B. J. *Multiplier operators on  $B^*$ -algebras*, 505.  
 Moore, Berrien III. *Erratum to "The Szegő infimum"*, 638.  
 Saworotnow, Parfeny P. *Generalized positive linear functionals on a Banach algebra with an involution*, 299.  
 Saworotnow, Parfeny P. and Giellis, George R. *Continuity and linearity of centralizers on a complemented algebra*, 142.  
 Shuchat, Alan H. *Approximation of vector-valued continuous functions*, 97.

**47. Operator Theory**

- Foiaş, Ciprian and Williams, J. P. *Some remarks on the Volterra operator*, 177.  
 Hagopian, Charles L. *Another fixed point theorem for plane continua*, 627.  
 Halmos, P. R. *Continuous functions of Hermitian operators*, 130.  
 Jacewicz, Chester Alan. *A nonprincipal invariant subspace of the Hardy space on the torus*, 127.  
 Metcalf, F. T. and Payne, T. H. *On the existence of fixed points in a totally ordered set*, 441.  
 Moore, Berrien III. *Erratum to "The Szegő infimum"*, 638.  
 Nelson, Paul, Jr. *Positive solutions of positive linear equations*, 453.

- Petryshyn, W. V. *Note on the structure of fixed point sets of 1-set-contractions*, 189.  
 Putnam, C. R. *The spectra of unbounded hyponormal operators*, 458.  
 Salehi, Habib. *Stone's theorem for a group of unitary operators over a Hilbert space*, 480.

### C. APPLIED MATHEMATICS

#### 90. Economics, Operations Research, Programming, Games

- Lapidot, Eitan. *The counting vector of a simple game*, 228.

### D. GEOMETRY

#### 50. Geometry

- Krauss, Peter. *Extending congruence relations*, 517.  
 Valentine, Joseph E. and Wayment, Stanley G. *Metric transforms and the hyperbolic four point property*, 232.

#### 52. Convex Sets and Geometric Inequalities

- Kalmanson, Kenneth. *Dual necklaces of  $n$ -dimensional cubes*, 511.  
 Valentine, Joseph E. and Wayment, Stanley G. *Metric transforms and the hyperbolic four point property*, 232.

#### 53. Differential Geometry

- \*do Carmo, M. and Lawson, B. *Spherical images of convex surfaces*, 635.  
 Chen, Bang-yen. *Minimal surfaces in  $S^m$  with Gauss curvature  $\leq 0$* , 235.

### E. LOGIC AND FOUNDATIONS

#### 02. Logic and Foundations

- Lucas, Th. *Equations in the theory of monadic algebras*, 239.  
 Moschovakis, Yiannis N. *The game quantifier*, 245.  
 Phillips, R. G. and Sperry, P. L. *Elementary extensions of linear topological abelian groups*, 525.  
 Tanaka, Hisao. *A property of arithmetic sets*, 521.

### F. STATISTICS AND PROBABILITY

#### 60. Probability Theory and Stochastic Processes

- Kanter, Marek. *A representation theorem for  $L^p$  spaces*, 472.  
 LePage, Raoul D. and Mandrekar, V. *Equivalence-singularity dichotomies from zero-one laws*, 251.

### G. TOPOLOGY

#### 22. Topological Groups, Lie Groups

- \*Hulanicki, A. and Pytlik, T. *On cyclic vectors of induced representations*, 633.  
 Morris, Sidney A. *Quotient groups of topological groups with no small subgroups*, 625.  
 Robbie, Desmond A. *Ordered power associative groupoids*, 285.  
 Saworotnow, Parfeny P. *Generalized positive linear functionals on a Banach algebra with an involution*, 299.  
 Wong, James C. S. *Invariant means on locally compact semigroups*, 39.

#### 54. General Topology

- De Marco, G. *On the countably generated  $z$ -ideals of  $C(X)$* , 574.  
 Garipey, Ronald and Pepe, W. D. *On the level sets of a distance function in a Minkowski space*, 255.  
 Hagopian, Charles L. *Another fixed point theorem for plane continua*, 627.  
 Harris, Douglas. *The Wallman compactification is an epireflection*, 265.

- Janos, Ludvik. *A metric characterization of zero-dimensional spaces*, 268.  
 Lozier, F. W. *A compactification of locally compact spaces*, 577.  
 Miller, Gary Glenn. *Sets accessible at each point only by wild arcs*, 583.  
 ———. *Rigid pairs of long arcs*, 591.  
 Nishiura, Togo and Rhee, Choon-Jai. *The hyperspace of a pseudoarc is a Cantor manifold*, 550.  
 Noble, N. *Products of uncountably many  $k$ -spaces*, 609.  
 ———.  *$C$ -embedded subsets of products*, 613.  
 Pettey, Dix H. *One-to-one mappings*, 276.  
 Richardson, G. D. and Kent, D. C. *Regular compactifications of convergence spaces*, 571.  
 Shirley, E. D. *Semilocal connectedness and cut points in metric continua*, 291.  
 Smithson, R. E. *Fixed point theorems for certain classes of multifunctions*, 595.  
 Williams, Stephen A. *An index for set-valued maps in infinite-dimensional spaces*, 557.

### 55. Algebraic Topology

- Chen, Yuh-Ching. *On Spanier's higher order operations*, 601.  
 Croom, F. H. *A product theorem for  $H$ -group fibrations*, 543.  
 Curtis, W. D. *A commutative diagram and an application to differentiable transformation groups*, 260.  
 Hagopian, Charles L. *Another fixed point theorem for plane continua*, 627.  
 Holzsager, Richard. *Stable splitting of  $K(G, 1)$* , 305.  
 Landweber, Peter S. *Equivariant bordism and cyclic groups*, 564.  
 Lin, T. Y. *Inadequacy of ordinary homology theory*, 617.  
 Miller, Gary Glenn. *Sets accessible at each point only by wild arcs*, 583.  
 Porter, Don. *An algebraic proof that  $[\Omega^u]_2 = \mathfrak{R}^2$* , 605.  
 Sigmon, Kermit. *A strong homotopy axiom for Alexander cohomology*, 271.  
 Sikkema, Carl D. *Pseudo-isotopies of arcs and knots*, 615.  
 Smith, Larry. *Manifolds with few cells and the stable homotopy of spheres*, 279.  
 \*Sutherland, W. A. *Vanishing of Stiefel-Whitney classes*, 637.  
 Ucci, Jack. *A note on fixed point free involutions and equivariant maps*, 297.  
 Ummel, Brian R. *Some examples relating the deleted product to imbeddability*, 307.  
 West, Robert W.  *$H$ -spaces which are co- $H$ -spaces*, 580.

### 57. Manifolds and Cell Complexes

- Alexander, J. C. *The bordism ring of manifolds with involution*, 536.  
 Anderson, Douglas R. *The Wall invariant of certain  $S^1$  bundles*, 529.  
 Casler, B. G. *A decomposition theorem for closed compact connected  $P.L.$   $n$ -manifolds*, 623.  
 Curtis, W. D. *A commutative diagram and an application to differentiable transformation groups*, 260.  
 Hagopian, Charles L. *Another fixed point theorem for plane continua*, 627.  
 Osborn, Howard. *Representations of Euler classes*, 340.  
 Porter, Don. *An algebraic proof that  $[\Omega^u]_2 = \mathfrak{R}^2$* , 605.  
 Ummel, Brian R. *Some examples relating the deleted product to imbeddability*, 307.

### 58. Global Analysis, Analysis on Manifolds

- Gibbons, Joel C. *A note on one-dimensional attracting sets in the three-sphere*, 620.  
 Osborn, Howard. *Representations of Euler classes*, 340.  
 \*Suffridge, T. J. *A holomorphic function having a discontinuous inverse*, 629.

## AUTHOR INDEX

\*Starred items are "Shorter Notes"

- Alexander, J. C. *The bordism ring of manifolds with involution*, 536.
- Anderson, Douglas R. *The Wall invariant of certain  $S^1$  bundles*, 529.
- Apostol, Tom M. *Dirichlet L-functions and primitive characters*, 384.
- \* Bachelis, G. F., Parker, W. A. and Ross, K. A. *Local units in  $L^1(G)$* , 312.
- Beauregard, Raymond A. *Localization in a principal right ideal domain*, 21.
- Bergman, George. See Ogus, Arthur.
- Berndt, Bruce C. *The functional equation of some Dirichlet series. II*, 24.
- Boyd, David W. and Kisilevsky, H. *On the exponent of the ideal class groups of complex quadratic fields*, 433.
- Brewer, James W. and Rutter, Edgar A. *A note on finitely generated ideals which are locally principal*, 429.
- Brown, David E. and Larsen, Max D. *Separation of nonassociates by valuations*, 326.
- Brown, Ezra. *The class number of  $Q(\sqrt{-p})$ , for  $p \equiv 1 \pmod{8}$  a prime*, 381.
- Bruning, L. M. and Leavitt, W. G. *Erratum to "Minimal generating sets for free modules"*, 638.
- Buck, R. C. *On the functional equation  $\phi(x) = g(x)\phi(\beta(x)) + u(x)$* , 159.
- \* do Carmo, M. and Lawson, B. *Spherical images of convex surfaces*, 635.
- Casler, B. G. *A decomposition theorem for closed compact connected P.L. n-manifolds*, 623.
- Chaffer, Robert A. *On algebras satisfying the identity  $(yx)x + x(xy) = 2(xy)x$* , 376.
- Chein, Orin. *Induced automorphisms of free metabelian groups*, 1.
- Chen, Bang-yen. *Minimal surfaces in  $S^m$  with Gauss curvature  $\leq 0$* , 235.
- Chen, Yuh-Ching. *On Spanier's higher order operations*, 601.
- Clancey, Kevin. *On the smoothness of eigenfunctions of hyponormal singular integral operators*, 475.
- Cline, R. E. See Plemmons, R. J.
- Coffman, Charles V. *On the bifurcation theory of semilinear elliptic eigenvalue problems*, 170.
- Cozzens, John and Johnson, Joseph. *Some applications of differential algebras to ring theory*, 354.
- Croom, F. H. *A product theorem for H-group fibrations*, 543.
- Curtis, W. D. *A commutative diagram and an application to differentiable transformation groups*, 260.
- Davis, William J. and Lindenstrauss, Joram. *On total nonnorming subspaces*, 109.
- De Marco, G. *On the countably generated z-ideals of  $C(X)$* , 574.
- DeMarr, Ralph and Steger, Arthur. *On elements with negative squares*, 57.
- Diamond, Harold G. *On a tauberian theorem of Wiener and Pitt*, 152.
- Dunkl, Charles F. and Ramirez, Donald E. *Bounded projections on Fourier-Stieltjes transforms*, 122.
- Duren, P. L. and Shapiro, H. S. *Interpolations in  $H^p$  spaces*, 162.
- Eakin, Paul. *A note on finite dimensional subrings of polynomial rings*, 75.
- Elman, Richard and Lam, T. Y. *Determination of  $k_n$  ( $n \geq 3$ ) for global fields*, 427.
- Etgen, Garret J. *A note on two point boundary problems for nonlinear matrix differential systems*, 213.
- Fennell, R. E. and Proctor, T. G. *On asymptotic behavior of perturbed nonlinear systems*, 499.

- Foiaş, Ciprian and Williams, J. P. *Some remarks on the Volterra operator*, 177.
- Fredman, M. L. *The distribution of absolutely irreducible polynomials in several indeterminates*, 387.
- Gariepy, Ronald and Pepe, W. D. *On the level sets of a distance function in a Minkowski space*, 255.
- Gibbons, Joel C. *A note on one-dimensional attracting sets in the three-sphere*, 620.
- Gibson, P. M. *Localization of the zeros of the permanent of a characteristic matrix*, 18.
- Giellis, George R. See Saworotnow, Parfeny P.
- Glass, A. M. W. *Which abelian groups can support a directed, interpolation order?*, 395.
- Golan, Jonathan S. *Characterization of rings using quasiprojective modules*. III, 401.
- Gowrisankaran, Kohur. *Measurability of functions in product spaces*, 485.
- Greenfield, Stephen J. *Hypoelliptic vector fields and continued fractions*, 115.
- Greenfield, Stephen J. and Wallach, Nolan R. *Global hypoellipticity and Liouville numbers*, 112.
- Gross, Fletcher. *Finite automorphic algebras over  $\text{GF}(2)$* , 10.
- Gupta, C. K. and Gupta, N. D. *On groups of exponent four*. II, 360.
- Gupta, N. D. See Gupta, C. K.
- Haddock, John R. *A remark on a stability theorem of M. Marachkoff*, 209.
- Hagopian, Charles L. *Another fixed point theorem for plane continua*, 627.
- Hall, Japheth, Jr. *The independence of certain axioms of structures in sets*, 317.
- Halmos, P. R. *Continuous functions of Hermitian operators*, 130.
- Harris, Douglas. *The Wallman compactification is an epireflection*, 265.
- Holzager, Richard. *Stable splitting of  $K(G, 1)$* , 305.
- \* Hulanicki, A. and Pytlik, T. *On cyclic vectors of induced representations*, 633.
- Jaciewicz, Chester Alan. *A nonprincipal invariant subspace of the Hardy space on the torus*, 127.
- Janos, Ludvik. *A metric characterization of zero-dimensional spaces*, 268.
- Jenkins, James A. *A remark on "pairs" of regular functions*, 119.
- Johnson, Johnny A. *Union conditions in Noether lattices*, 391.
- Johnson, Joseph. See Cozzens, John.
- Jones, John, Jr. *Solutions of certain matrix equations*, 333.
- Kalmanson, Kenneth. *Dual necklaces of  $n$ -dimensional cubes*, 511.
- Kanter, Marek. *A representation theorem for  $L^p$  spaces*, 472.
- Kent, D. C. See Richardson, G. D.
- Kisilevsky, H. See Boyd, David W.
- Krauss, Peter. *Extending congruence relations*, 517.
- Kreith, Kurt. *A Prüfer transformation for nonselfadjoint systems*, 147.
- Lal, Nand and Merrill, Samuel III. *Isometries of  $H^p$  spaces of the torus*, 465.
- Lam, T. Y. See Elman, Richard.
- Landweber, Peter S. *Equivariant bordism and cyclic groups*, 564.
- Lapidot, Eitan. *The counting vector of a simple game*, 228.
- Larsen, Max D. See Brown, David E.
- Lawson, B. See do Carmo, M.
- Leavitt, W. G. See Bruning, L. M.
- LePage, Raoul D. and Mandrekar, V. *Equivalence-singularity dichotomies from zero-one laws*, 251.
- Lewin, Jacques. *A note on zero divisors in group-rings*, 357.
- Lewis, D. R. *Spaces on which each absolutely summing map is nuclear*, 195.
- Lin, T. Y. *Inadequacy of ordinary homology theory*, 617.
- Lindenstrauss, Joram. See Davis, William J.

- Lozier, F. W. *A compactification of locally compact spaces*, 577.
- Lu, Chin-Pi. *A generalization of Mori's theorem*, 373.
- Lucas, Th. *Equations in the theory of monadic algebras*, 239.
- Malviya, B. D. and Tomiuk, B. J. *Multiplier operators on  $B^*$ -algebras*, 505.
- Mandrekar, V. and Salehi, H. *On a factorization theorem of D. Lowdenslager*, 185.
- Mandrekar, V. See LePage, Raoul D.
- Merrill, Samuel III. See Lal, Nand.
- Merris, Russell and Pierce, Stephen. *Monotonicity of positive semidefinite hermitian matrices*, 437.
- Metcalf, F. T. and Payne, T. H. *On the existence of fixed points in a totally ordered set*, 441.
- Miller, Gary Glenn. *Sets accessible at each point only by wild arcs*, 583.
- . *Rigid pairs of long arcs*, 591.
- Miller, James. *Starlike meromorphic functions*, 446.
- Miller, Robert W. and Turnidge, Darrell R. *Morita duality for endomorphism rings*, 91.
- Montgomery, Susan. *Algebraic algebras with involution*, 368.
- Moore, Berrien III. *Errata to "The Szegő infimum"*, 638.
- Mordeson, J. N. and Vinograd, B. *Separating  $p$ -bases and transcendental extension fields*, 417.
- Morris, Sidney A. *Quotient groups of topological groups with no small subgroups*, 625.
- Moschovakis, Yiannis N. *The game quantifier*, 245.
- Myung, Hyo Chul. *A note on Lie-admissible nilalgebras*, 95.
- Nakai, Mitsuru and Sario, Leo. *Quasiharmonic classification of Riemannian manifolds*, 165.
- Nelson, Paul, Jr. *Positive solutions of positive linear equations*, 453.
- Newman, D. J. *A new  $l_1$  estimate and a problem of Katznelson*, 225.
- Newman, Kenneth. *Constructing sequences of divided powers*, 32.
- Newman, Morris. *2-generator groups and parabolic class numbers*, 51.
- Nishiura, Togo and Rhee, Choon-Jai. *The hyperspace of a pseudoarc is a Cantor manifold*, 550.
- Noble, N. *Products of uncountably many  $k$ -spaces*, 609.
- .  *$C$ -embedded subsets of products*, 613.
- Ogus, Arthur and Bergman, George. *Nakayama's Lemma for half-exact functors*, 67.
- Osborn, Howard. *Representations of Euler classes*, 340.
- Parker, W. A. See Bachelis, G. F.
- Passman, D. S. *Minimal ideals in group rings*, 81.
- . *Group rings satisfying a polynomial identity*. III, 87.
- Payne, T. H. See Metcalf, F. T.
- Pepe, W. D. See Gariepy, Ronald.
- Petryshyn, W. V. *Note on the structure of fixed point sets of 1-set-contractions*, 189.
- Petty, Dix H. *One-to-one mappings*, 276.
- Phillips, R. G. and Sperry, P. L. *Elementary extensions of linear topological abelian groups*, 525.
- Pierce, Stephen. See Merris, Russell.
- Plemmons, R. J. and Cline, R. E. *The generalized inverse of a nonnegative matrix*, 46.
- Porter, Don. *An algebraic proof that  $[\Omega^0]_2 = \mathfrak{R}^2$* , 605.
- Proctor, T. G. *Periodic solutions for perturbed nonlinear differential equations*. II, 219.
- . See Fennell, R. E.
- Putnam, C. R. *The spectra of unbounded hyponormal operators*, 458.
- Pytlik, T. See Hulanicki, A.

- \* Ramachandran, D. *A note on finitely additive set functions*, 314.
- Ramirez, Donald E. See Dunkl, Charles F.
- Renaud, P. F. *Equivalent types of invariant means on locally compact groups*, 495.
- Rhee, Choon-Jai. See Nishiura, Togo.
- Richardson, G. D. and Kent, D. C. *Regular compactifications of convergence spaces*, 571.
- \* Ristroph, Robert. *Pólya's Property W and factorization—A short proof*, 631.
- Robbie, Desmond A. *Ordered power associative groupoids*, 285.
- Roggenkamp, Klaus W. *An extension of the Noether-Deuring theorem*, 423.
- Ross, K. A. See Bachelis, G. F.
- Rutter, Edgar A. See Brewer, James W.
- Salehi, Habib. *Stone's theorem for a group of unitary operators over a Hilbert space*, 480.
- . See Mandrekar, V.
- Sandomierski, F. L. *Modules over the endomorphism ring of a finitely generated projective module*, 27.
- Sario, Leo. See Nakai, Mitsuru.
- \* Sato, Daihachiro. *Algebraic solution of  $x^y = y^x$  ( $0 < x < y$ )*, 316.
- Saworotnow, Parfeny P. *Generalized positive linear functionals on a Banach algebra with an involution*, 299.
- Saworotnow, Parfeny P. and Giellis, George R. *Continuity and linearity of centralizers on a complemented algebra*, 142.
- Schacher, Murray M. *More on the Schur subgroup*, 15.
- Scribner, D. R. *The Lie algebra of the structure group of a power-associative algebra*, 363.
- Seifert, George. *On almost periodic solutions for undamped systems with almost periodic forcing*, 104.
- Shapiro, H. S. See Duren, P. L.
- Shirley, E. D. *Semi-local connectedness and cut points in metric continua*, 291.
- Shuchat, Alan H. *Approximation of vector-valued continuous functions*, 97.
- Sigmon, Kermit. *A strong homotopy axiom for Alexander cohomology*, 271.
- Sikkema, Carl D. *Pseudo-isotopies of arcs and knots*, 615.
- Singhal, J. P. See Srivastava, H. M.
- Smith, Larry. *Manifolds with few cells and the stable homotopy of spheres*, 279.
- Smithson, R. E. *Fixed point theorems for certain classes of multifunctions*, 595.
- Sperry, P. L. See Phillips, R. G.
- Srivastava, H. M. *Remark on some integrals involving products of Whittaker functions*, 133.
- Srivastava, H. M. and Singhal, J. P. *Some extensions of the Mehler formula*, 135.
- Steger, Arthur. See DeMarr, Ralph.
- Steinberg, Stuart A. *An embedding theorem for commutative lattice-ordered domains*, 409.
- Stewart, Patrick N. *Divinsky's radical*, 347.
- Stringall, Robert W. *Primary modules determined by indecomposable idempotent endomorphisms*, 54.
- Subramanian, H. *Principal ideals in the ideal lattice*, 445.
- \* Suffridge, T. J. *A holomorphic function having a discontinuous inverse*, 629.
- \* Sutherland, W. A. *Vanishing of Stiefel-Whitney classes*, 637.
- Tanaka, Hisao. *A property of arithmetic sets*, 521.
- Thaler, A. I. *A nonarchimedean theory of analytic continuation in several variables*, 61.
- Tomiuk, B. J. See Malviya, B. D.
- Travis, Curtis C. *Oscillation theorems for second-order differential equations with functional arguments*, 199.
- Turnidge, Darrell R. See Miller, Robert W.

- Ucci, Jack. *A note on fixed point free involutions and equivariant maps*, 297.
- Ummel, Brian R. *Some examples relating the deleted product to imbeddability*, 307.
- Valentine, Joseph E. and Wayment, Stanley G. *Metric transforms and the hyperbolic four point property*, 232.
- Vinograde, B. See Mordeson, J. N.
- Wallach, Nolan R. See Greenfield, Stephen J.
- Wayment, Stanley G. See Valentine, Joseph E.
- West, Robert W. *H-spaces which are co-H-spaces*, 580.
- Williams, J. P. See Foiaş, Ciprian.
- Williams, Stephen A. *An index for set-valued maps in infinite-dimensional spaces*, 557.
- Wong, James C. S. *Invariant means on locally compact semigroups*, 39.
- Zauderer, Erich. *A uniform asymptotic turning point theory for second order linear ordinary differential equations*, 489.
- Zettl, Anton. *Factorization and disconjugacy of third order differential equations*, 203.

## Submission of Manuscript

Send papers directly to one of the editors listed under the subject field of the paper,

*Algebra and number theory.*

GEORGE B. SELIGMAN, Department of Mathematics, Yale University, New Haven, Connecticut 06520

JOSEPH J. ROTMAN, Department of Mathematics, University of Illinois, Urbana, Illinois 61801

*Modern or classical analysis.*

JACOB FELDMAN, Department of Mathematics, University of California, Berkeley, California 94720

LEE A. RUBEL, Department of Mathematics, University of Illinois, Urbana, Illinois 61801

ALLEN L. SHIELDS, Department of Mathematics, University of Michigan, Ann Arbor, Michigan 48104

*Algebraic geometry.*

GEORGE B. SELIGMAN, Department of Mathematics, Yale University, New Haven, Connecticut 06520

*Set-theoretic and general topology.*

W. WISTAR COMFORT, Department of Mathematics, Wesleyan University, Middletown, Connecticut 06457

*Algebraic topology and all other types of geometry.*

GLEN E. BREDON, Department of Mathematics, Rutgers University, New Brunswick, New Jersey 08903

*Applied mathematics, differential equations, and related areas of analysis.*

FRED G. BRAUER, Department of Mathematics, University of Wisconsin, Madison, Wisconsin 53706

*Probability, statistics, and related fields.*

JAMES D. KUELBS, Department of Mathematics, 213 Van Vleck Hall, University of Wisconsin, Madison, Wisconsin 53706

*Logic, set theory, and related areas.*

ROBERT I. SOARE, Department of Mathematics, University of Illinois at Chicago Circle, Chicago, Illinois 60680

All other communications should be addressed to the Managing Editor, JOSEPH J. ROTMAN, at the above address.

## Reprints and Address Changes

Any inquiries concerning a paper which has been accepted for publication, including information regarding reprints or changes of address for mailing proof, should be sent directly to the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02904.

CONTENTS—Continued from back cover

Measurability of functions in product spaces. By KOHUR GOWRISANKARAN . . . . .	485
A uniform asymptotic turning point theory for second order linear ordinary differential equations. By ERICH ZAUDERER . . . . .	489
Equivalent types of invariant means on locally compact groups. By P. F. RENAUD	495
On asymptotic behavior of perturbed nonlinear systems. By R. E. FENNELL and T. G. PROCTOR . . . . .	499
Multiplier operators on $B^*$ -algebras. By B. D. MALVIYA and B. J. TOMIUK . . . . .	505

D. GEOMETRY

Dual necklaces of $n$ -dimensional cubes. By KENNETH KALMANSON . . . . .	511
Extending congruence relations. By PETER KRAUSS . . . . .	517

E. LOGIC AND FOUNDATIONS

A property of arithmetic sets. By HISAO TANAKA . . . . .	521
Elementary extensions of linear topological abelian groups. By R. G. PHILLIPS and P. L. SPERRY . . . . .	525

G. TOPOLOGY

The Wall invariant of certain $S^1$ bundles. By DOUGLAS R. ANDERSON . . . . .	529
The bordism ring of manifolds with involution. By J. C. ALEXANDER . . . . .	536
A product theorem for $H$ -group fibrations. By F. H. CROOM . . . . .	543
The hyperspace of a pseudoarc is a Cantor manifold. By TOGO NISHIURA and CHOON-JAI RHEE . . . . .	550
An index for set-valued maps in infinite-dimensional spaces. By STEPHEN A. WILLIAMS . . . . .	557
Equivariant bordism and cyclic groups. By PETER S. LANDWEBER . . . . .	564
Regular compactifications of convergence spaces. By G. D. RICHARDSON and D. C. KENT . . . . .	571
On the countably generated $z$ -ideals of $C(X)$ . By G. DE MARCO . . . . .	574
A compactification of locally compact spaces. By F. W. LOZIER . . . . .	577
$H$ -spaces which are co- $H$ -spaces. By ROBERT W. WEST . . . . .	580
Sets accessible at each point only by wild arcs. By GARY GLENN MILLER . . . . .	583
Rigid pairs of long arcs. By GARY G. MILLER . . . . .	591
Fixed point theorems for certain classes of multifunctions. By R. E. SMITHSON . . . . .	595
On Spanier's higher order operations. By YUH-CHING CHEN . . . . .	601
An algebraic proof that $[\Omega^q]_2 = \mathfrak{N}^2$ . By DON PORTER . . . . .	605
Products of uncountably many $k$ -spaces. By N. NOBLE . . . . .	609
$C$ -embedded subsets of products. By N. NOBLE . . . . .	613
Pseudo-isotopies of arcs and knots. By CARL D. SIKKEMA . . . . .	615
Inadequacy of ordinary homology theory. By T. Y. LIN . . . . .	617
A note on one-dimensional attracting sets in the three-sphere. By JOEL C. GIBBONS . . . . .	620
A decomposition theorem for closed compact connected P.L. $n$ -manifolds. By B. G. CASLER . . . . .	623
Quotient groups of topological groups with no small subgroups. By SIDNEY A. MORRIS . . . . .	625
Another fixed point theorem for plane continua. By CHARLES L. HAGOPIAN . . . . .	627

SHORTER NOTES

A holomorphic function having a discontinuous inverse. By T. J. SUFFRIDGE . . . . .	629
Pólya's property $W$ and factorization—A short proof. By ROBERT RISTROPH . . . . .	631
On cyclic vectors of induced representations. By A. HULANICKI and T. PYTLIK . . . . .	633
Spherical images of convex surfaces. By M. DO CARMO and B. LAWSON . . . . .	635
Vanishing of Stiefel-Whitney classes. By W. A. SUTHERLAND . . . . .	637
Erratum to Volume 27 . . . . .	638
Erratum to Volume 29 . . . . .	638
AMS (MOS) Major Subject Headings (1970) . . . . .	639
Index to Volume 31 . . . . .	641

# CONTENTS\*

**Vol. 31, No. 2**

**FEBRUARY 1972**

**Whole No. 152**

	Page
A. ALGEBRA AND NUMBER THEORY	
The independence of certain axioms of structures in sets. By JAPHETH HALL, JR. . . . .	317
Separation of nonassociates by valuations. By DAVID E. BROWN and MAX D. LARSEN. . . . .	326
Solution of certain matrix equations. By JOHN JONES, JR. . . . .	333
Representations of Euler classes. By HOWARD OSBORN. . . . .	340
Divinsky's radical. By PATRICK N. STEWART. . . . .	347
Some applications of differential algebra to ring theory. By JOHN COZZENS and JOSEPH JOHNSON . . . . .	354
A note on zero divisors in group-rings. By JACQUES LEWIN . . . . .	357
On groups of exponent four. II. By C. K. GUPTA and N. D. GUPTA . . . . .	360
The Lie algebra of the structure group of a power-associative algebra. By D. R. SCRIBNER . . . . .	363
Algebraic algebras with involution. By SUSAN MONTGOMERY . . . . .	368
A generalization of Mori's theorem. By CHIN-PI LU . . . . .	373
On algebras satisfying the identity $(yx)x + x(xy) = 2(xy)x$ . By ROBERT A. CHAFFER	376
The class number of $Q(\sqrt{-p})$ , for $p \equiv 1 \pmod{8}$ a prime. By EZRA BROWN . . . . .	381
Dirichlet $L$ -functions and primitive characters. By TOM M. APOSTOL . . . . .	384
The distribution of absolutely irreducible polynomials in several indeterminates. By M. L. FREDMAN . . . . .	387
Union conditions in Noether lattices. By JOHNNY A. JOHNSON . . . . .	391
Which abelian groups can support a directed, interpolation order? By A. M. W. GLASS . . . . .	395
Characterization of rings using quasiprojective modules. III. By JONATHAN S. GOLAN . . . . .	401
An embedding theorem for commutative lattice-ordered domains. By STUART A. STEINBERG . . . . .	409
Separating $p$ -bases and transcendental extension fields. By J. N. MORDESON and B. VINOGRADÉ. . . . .	417
An extension of the Noether-Deuring theorem. By KLAUS W. ROGGENKAMP . . . . .	423
Determination of $k_n$ ( $n \geq 3$ ) for global fields. By RICHARD ELMAN and T. Y. LAM. . . . .	427
A note on finitely generated ideals which are locally principal. By JAMES W. BREWER and EDGAR A. RUTTER. . . . .	429
On the exponent of the ideal class groups of complex quadratic fields. By DAVID W. BOYD and H. KISILEVSKY . . . . .	433
Monotonicity of positive semidefinite hermitian matrices. By RUSSELL MERRIS and STEPHEN PIERCE. . . . .	437
On the existence of fixed points in a totally ordered set. By F. T. METCALF and T. H. PAYNE . . . . .	441
Principal ideals in the ideal lattice. By H. SUBRAMANIAN . . . . .	445
B. ANALYSIS	
Starlike meromorphic functions. By JAMES MILLER . . . . .	446
Positive solutions of positive linear equations. By PAUL NELSON, JR. . . . .	453
The spectra of unbounded hyponormal operators. By C. R. PUTNAM . . . . .	458
Isometries of $H^p$ spaces of the torus. By NAND LAL and SAMUEL MERRILL III. . . . .	465
A representation theorem for $L^p$ spaces. By MAREK KANTER. . . . .	472
On the smoothness of eigenfunctions of hyponormal singular integral operators. By KEVIN CLANCEY . . . . .	475
Stone's theorem for a group of unitary operators over a Hilbert space. By HABIB SALEHI . . . . .	480

\* The volume indexes contain a mapping showing the correspondence between sections A-G and the AMS (MOS) subject classification numbers.

*Continued on inside back cover*