## Pacific

Journal of
Mathematics

VOLUME XX
1967

# PACIFIC JOURNAL OF MATHEMATICS 

## EDITORS

H. Samelson<br>Stanford University<br>Stanford, California<br>J. P. Jans<br>University of Washington<br>Seattle, Washington 98105

J. Dugundji

University of Southern California
Los Angeles, California 90007
Richard Arens
University of California
Los Angeles, California 90024

## ASSOCIATE EDITORS

E. F. Beckenbach
B. H. Neumann
F. Wolf
K. Yosida

## SUPPORTING INSTITUTIONS

UNIVERSITY OF BRITISH COLUMBIA
CALIFORNIA INSTITUTE OF TECHNOLOGY UNIVERSITY OF CALIFORNIA MONTANA STATE UNIVERSITY UNIVERSITY OF NEVADA
NEW MEXICO STATE UNIVERSITY OREGON STATE UNIVERSITY UNIVERSITY OF OREGON OSAKA UNIVERSITY UNIVERSITY OF SOUTHERN CALIFORNIA

STANFORD UNIVERSITY
UNIVERSITY OF TOKYO
UNIVERSITY OF UTAH
WASHINGTON STATE UNIVERSITY
UNIVERSITY OF WASHINGTON

*     *         * 

AMERICAN MATHEMATICAL SOCIETY CHEVRON RESEARCH CORPORATION TRW SYSTEMS
NAVAL ORDNANCE TEST STATION

## CONTENTS

Dallas O. Banks, Lower bounds for the eigenvalues of a vibrating string whose density satisfies a Lipschitz condition ..... 393
L. D. Baumert, Extreme copositive quadratic forms, 11. ..... 1
Ralph J. Bean, Decompositions of $E^{3}$ which yield $E^{3}$ ..... 441
E. L. Bethel, A note on continuous collections of disjoint continua ..... 21
D. L. Boyer and A. Mader, A representation theorem for abelian groups with no elements of infinite of p-height ..... 31
Robert B. Brown, On generalized Cayley-Dickson algebras ..... 415
Richard D. Byrd, Complete distributivity in lattice-ordered groups ..... 423
R. S. Countryman, Jr., On the characterization of compact Haus- dorff $X$ for which $C(X)$ is algebraically closed ..... 433
Cecil Craig, Jr. and A. J. Macintyre, Inequalities for functions regular and bounded in a circle ..... 449
Edward D. Davis, Ideals of the principal class, $R$-sequences and a certain monoidal transformation. ..... 197
Jean-Claude Derdérian, Residuated mappings ..... 35
R. M. Dudley, Sub-stationary processes ..... 207
Burton Fein, Representations of direct products of finite groups. ..... 45
John Garnett, A topological characterization of Gleason parts ..... 59
N. S. Hawley and M. M. Schiffer, Riemann surfaces which are doubles of plane domains ..... 217
Takesi Isiwata, Mappings and spaces ..... 455
B. E. Johnson, Continuity of transformations which leave in- variant certain translation invariant subspaces ..... 223
D. G. Johnson, See J. E. Mack and D. G. Johnson ..... 231
Herbert Kamowitz, On operators whose spectrum lies on a circle or a line ..... 65
Ignacy Kotlarski, On characterizing the gamma and the normal distribution ..... 69
Yu-Lee Lee, Topologies with the same class of homeomorphisms. ..... 77
A. J. Macintyre, See Cecil Craig, Jr. and A. J. Macintyre ..... 449
J. E. Mack and D. G. Johnson, The dedekind completion of C( $\mathscr{X})$. ..... 231
A. Mader, See D. L. Boyer and A. Mader ..... 31
Moshe Mangad, Asymptotic expansions of Fourier transforms and discrete polyharmonic Green's functions ..... 85
Jürg T. Marti, On integro-differential equations in Banach spaces. ..... 99
K. K. Mathur and R. B. Saxena, On the convergence of quasi- Hermite-Fejér interpolation ..... 245
H. D. Miller, Generalization of a theorem of Marcinkiewicz ..... 261
Joseph B. Muskat, Reciprocity and Jacobi sums ..... 275
Stelios Negrepontis, On a theorem by Hoffman and Ramsay. ..... 281
Paul A. Nickel, A note on principal functions and multiplyvalent canonical mappings ..... 283
D. L. Outcalt, Power-associative algebras in which every sub- algebra is an ideal ..... 481
Walter Philipp, Some metrical theorems in number theory ..... 109
Sidney C. Port, Equilibrium systems of stable processes ..... 487
Maxwell Rosenlicht, Another proof of a theorem on rational cross sections ..... 129
Kenneth A. Ross and Karl Stromberg, Jessen's theorem on Riemann sums for locally compact groups ..... 135
R. B. Saxena, See K. K. Mathur and R. B. Saxena ..... 245
M. M. Schiffer, See N. S. Hawley and M. M. Schiffer ..... 217
Jack Segal, Quasi dimension type. I. Types in the real line ..... 501
S. Simons, A theorem on lattice ordered groups, results of Ptak, Namioka and Banach, and a front-ended proof of Lebesgue's theorem ..... 149
Morton L. Slater, On the equation $\varphi(x)=\int_{x}^{x+1} K(\xi) f[(\varphi \xi)] d \xi$ ..... 155
A. W. J. Stoddart, Existence of optimal controls ..... 167
Robert W. Stringall, Endomorphism rings of primary abelian groups ..... 535
Karl Stromberg, See Kenneth A. Ross and Karl Stromberg ..... 135
W. J. Sweeney, 'The ò-Poincaré estimate' ..... 559
R. C. Thompson, On a class of matrix equations ..... 289
David M. Topping, Asymptoticity and semimodularity in projection lattices ..... 317
Burnett R. Toskey, A system of canonical forms for rings on a direct sum of two infinite cyclic groups ..... 179
L. Tzafriri, Operators commuting with Boolean algebras of pro- jections of finite multiplicity ..... 571
J. E. Vaughan, A modification of Morita's characterization of dimension ..... 189
James R. Webb, A Hellinger integral representation for bounded linear functionals ..... 327
Joel J. Westman, Locally trivial $C^{r}$ groupoids and their represen- tations ..... 339
H. Wu, Holonomy groups of indefinite matrics. ..... 351

## Pacific Mathematics

L. D. Baumert, Extreme copositive quadratic forms, II ..... 1
E. L. Bethel, A note on continuous collections of disjoint continua ..... 21
D. L. Boyer and A. Mader, A representation theorem for abelian groups with no elements of infinite p-height ..... 31
Jean-Claude Derdérian, Residuated mappings ..... 35
Burton Fein, Representations of direct products of finite groups ..... 45
John Garnett, A topological characterization of Gleason parts ..... 59
Herbert Kamowitz, On operators whose spectrum lies on a circle or a line ..... 65
Ignacy Kotlarski, On characterizing the gamma and the normal distribution ..... 69
Yu-Lee Lee, Topologies with the same class of homeomor- phisms ..... 77
Moshe Mangad, Asymptotic expansions of Fourier transforms and discrete polyharmonic Green's functions. ..... 85
Jürg T. Marti, On integro-differential equations in Banach spaces ..... 99
Walter Philipp, Some metrical theorems in number theory ..... 109
Maxwell Rosenlicht, Another proof of a theorem on rational cross sections ..... 129
Kenneth A. Ross and Karl Stromberg, Jessen's theorem on Riemann sums for locally compact groups ..... 135
S. Simons, A theorem on lattice ordered groups, results of Ptak, Namioka and Banach, and a front-ended proof of Lebesgue's theorem ..... 149
Morton L. Slater, On the equatoin $\varphi(x)=\int_{x}^{x+1} K(\xi) f[(\varphi \xi)] d \xi$ ..... 155
A. W. J. Stoddart, Existence of optimal controls ..... 167
Burnett R. Toskey, A system of canonical forms for rings on a direct sum of two infinite cyclic groups ..... 179
J. E. Vaughan, A modification of Morita's characterization of dimension ..... 189

# PACIFIC JOURNAL OF MATHEMATICS 

## EDITORS

H. Samelson<br>Stanford University<br>Stanford, California

J. P. Jans

University of Washington
Seattle, Washington 98105
J. Dugundji

University of Southern California
Los Angeles, California 90007
Richard Arens
University of California
Los Angeles, California 90024

## ASSOCIATE EDITORS

E. F. Beckenbach<br>B. H. Neumann<br>F. Wolf<br>K. Yosida

## SUPPORTING INSTITUTIONS

UNIVERSITY OF BRITISH COLUMBIA<br>CALIFORNIA INSTITUTE OF TECHNOLOGY<br>UNIVERSITY OF CALIFORNIA<br>MONTANA STATE UNIVERSITY<br>UNIVERSITY OF NEVADA<br>NEW MEXICO STATE UNIVERSITY<br>OREGON STATE UNIVERSITY<br>UNIVERSITY OF OREGON<br>OSAKA UNIVERSITY<br>UNIVERSIT 1 OF SOUTHERN CALIFORNIA

STANFORD UNIVERSITY<br>UNIVERSITY OF TOKYO<br>UNIVERSITY OF UTAH<br>WASHINGTON STATE UNIVERSITY<br>UNIVERSITY OF WASHINGTON<br>AMERICAN MATHEMATICAL SOCIETY<br>CHEVRON RESEARCH CORPORATION<br>TRW SYSTEMS<br>NAVAL ORDNANCE TEST STATION

Mathematical papers intended for publication in the Pacific Journal of Mathematics should be typewritten (double spaced). The first paragraph or two must be capable of being used separately as a synopsis of the entire paper. It should not contain references to the bibliography. Manuscripts may be sent to any one of the four editors. All other communications to the editors should be addressed to the managing editor, Richard Arens at the University of California, Los Angeles, California 90024.

50 reprints per author of each article are furnished free of charge; additional copies may be obtained at cost in multiples of 50 .

The Pacific Journal of Mathematics is published monthly. Effective with Volume 16 the price per volume ( 3 numbers) is $\$ 8.00$; single issues, $\$ 3.00$. Special price for current issues to individual faculty members of supporting institutions and to individual members of the American Mathematical Society: $\$ 4.00$ per volume; single issues $\$ 1.50$. Back numbers are available.

Subscriptions, orders for back numbers, and changes of address should be sent to Pacific Journal of Mathematics, 103 Highland Boulevard, Berkeley 8, California.

Printed at Kokusai Bunken Insatsusha (International Academic Printing Co., Ltd.), No. 6, 2-chome, Fujimi-cho, Chiyoda-ku, Tokyo, Japan.

PUBLISHED BY PACIFIC JOURNAL OF MATHEMATICS, A NON-PROFIT CORPORATION
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 1 ts content or policies.

