

PROCEEDINGS
OF THE
AMERICAN MATHEMATICAL SOCIETY.

EDITED BY

ELDON DYER	P. R. HALMOS
M. H. HEINS	FRITZ JOHN
ALEX ROSENBERG	GEORGE WHAPLES

WITH THE COÖPERATION OF

Y. W. CHEN	C. W. CURTIS	E. E. FLOYD
AVNER FRIEDMAN	F. W. GEHRING	MICHEL KERVAIRE
W. J. LEVEQUE	DANA SCOTT	S. M. SHAH
A. H. TAUB		DANIEL ZELINSKY

VOLUME 13, NUMBER 4
AUGUST, 1962

PUBLISHED BY THE AMERICAN MATHEMATICAL SOCIETY
PROVIDENCE, RHODE ISLAND

Journals Published by the American Mathematical Society

Bulletin of the American Mathematical Society

This journal is the official organ of the Society. It reports official acts of the Society and details of its meetings. It contains some of the officially invited addresses presented before the Society, research announcements and problems, and reviews of advanced mathematical books.

One volume of six numbers is planned for 1962. The subscription price is \$7.00. The prices of back volumes, insofar as they are available, are as follows: vols. 1-27, 29 (1894-1921, 1923), \$23.50 each; vol. 28 (1922), \$19.70 each; vols. 30-35 (1924-1929), \$20.00 each; vols. 36-55 (1930-1949), \$28.00 each; vols. 56-67 (1950-1961), \$14.00 each.

Proceedings of the American Mathematical Society

This journal is devoted entirely to research in pure and applied mathematics, and is devoted principally to the publication of original papers of moderate length. A department called SHORTER NOTES was established in 1961. The purpose of this department is to publish very short papers (maximum length, 1 printed page) of an unusually elegant and polished character, for which there is normally no other outlet. The definitive new proof of an important and long-known theorem, an illuminating new fact, or an interesting lemma used for proof of a theorem in a different field are examples of subjects suitable for publication in this department.

Articles for insertion in the PROCEEDINGS should be typewritten, double spaced. The maximum length of an acceptable paper is 8 printed pages. (A page of the PROCEEDINGS contains an average of 400 words; a typewritten page contains an average of 300 words. A rough rule of thumb, accordingly, is that under 10 typewritten pages is probably within the allowed limit, but over 11 typewritten pages is probably not.) The greatest possible care should be taken in preparing the manuscript and if necessary The Manual for Authors published by the Society should be consulted. The authors should keep a complete copy.

Papers in algebra and number theory should be sent to ALEX ROSENBERG, Department of Mathematics, Cornell University, Ithaca, New York or GEORGE WHAPLES, Department of Mathematics, Indiana University, Bloomington, Indiana; in probability, real variables, logic, and foundations to P. R. HALMOS, Department of Mathematics, University of Michigan, Ann Arbor, Michigan; in abstract analysis to either P. R. HALMOS or ALEX ROSENBERG; in geometry and topology to ELDON DYER, Eckhart Hall, University of Chicago, Chicago 37, Illinois; in other branches of analysis, applied mathematics, and all other fields to M. H. HEINS, Department of Mathematics, University of Illinois, Urbana, Illinois or FRITZ JOHN, Institute of Mathematical Sciences, 4 Washington Place, New York 3, New York. All other communications to the editors should be addressed to the Managing Editor, Alex Rosenberg.

One volume of six numbers is planned for 1962. The subscription price is \$11.00. Vols. 1-12 (1950-1961) are available at the price of \$14.00 each. Volume 1 was published in 1950.

Transactions of the American Mathematical Society

This journal is devoted entirely to research in pure and applied mathematics, and includes in general longer memoirs than the PROCEEDINGS.

Four volumes of three numbers each will be published in 1962. The price per volume is \$8.00. All inquiries for volumes 1-69 should be directed to Johnson Reprint Corporation, 111 Fifth Avenue, New York 3, New York. Orders for volumes 70-101 should be directed to the American Mathematical Society; the price for back issues insofar as they are available is \$4.00 per issue (vols. 78-89 contain 2 issues, volumes 70-77 and 90-103 contain 3 issues).

The PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY is published bimonthly, in February, April, June, August, October, and December. Price per annual volume is \$11.00. Subscriptions, orders for back numbers, and inquiries in regard to nondelivery of current numbers should be addressed to the American Mathematical Society, 190 Hope Street, Providence 6, R. I.

Second-class postage paid at Providence, Rhode Island and additional mailing offices. Authorization is granted under the authority of the act of August 24, 1912, as amended by the act of August 4, 1947 (sec. 34.21, P. L. & R.). Acceptance for mailing at the special rate of postage provided for in section 34.40, paragraph d., P. L. & R.

Copyright ©, American Mathematical Society, 1962

Printed in the United States of America

Journals Published by the American Mathematical Society

Mathematical Reviews

This journal contains abstracts and reviews of the current mathematical literature of the world. It is sponsored by thirteen mathematical organizations, located both in the United States and abroad.

The publication of MATHEMATICAL REVIEWS was begun in 1940. Starting in 1961, it appears monthly, in two parts. Prior to 1961 it appeared in eleven single issues. Orders for complete volumes only are accepted. The price per volume is \$50.00 except volumes 1-16 (1940-1955) which are available at \$42.00 per volume. In 1962, it is being published in two volumes; the price of each volume will be \$50.00.

Soviet Mathematics—Doklady

This journal contains the entire pure mathematics section of the DOKLADY AKADEMII NAUK SSSR in translation. It appears six times a year, each bimonthly issue corresponding to one volume of the Soviet DOKLADY. (The DOKLADY AKADEMII NAUK SSSR is issued three times a month, six issues constituting a volume.)

Rates per annual volume are as follows: Domestic subscriptions, \$17.50; foreign subscriptions, \$20.00. Single issues are \$5.00. Back volumes are \$30.00.

Notices of the American Mathematical Society

This journal announces the programs of the meetings of the Society. It carries the abstracts of all contributed papers presented at the meetings of the Society and publishes news items of interest to mathematical scientists.

The subscription price is \$7.00 per annual volume. A single copy is \$2.00. Back issues: \$14.00 per volume. None available before vol. 5 (1958).

All communications should be addressed to the Editor, 190 Hope Street, Providence 6, R. I. News items and insertions for each issue must be in the hands of the editor on or before the deadline for the abstracts of the papers to be presented in the meetings announced in that issue. These deadlines are published regularly on the back of the table of contents.

Mathematics of Computation

A journal devoted to original papers in numerical analysis, the application of numerical methods and high-speed calculator devices, the computation of mathematical tables, the theory of high-speed calculating devices and other aids to computation. In addition it publishes reviews and notes in these and related fields. Published by the Society for the National Academy of Sciences-National Research Council.

Subscription price is \$8.00 per volume of 4 issues. Single copies are \$2.50. Back issues insofar as they are available are as follows: 1943-1947, \$1.00 per issue; 1948-1949, \$1.25 per issue; 1950-1958, \$1.50 per issue (or \$5.00 per volume); 1959-1961, \$2.50 per issue (or \$8.00 per volume).

Chinese Mathematics—Acta

This is a cover-to-cover translation into English of Acta Mathematica Sinica, published by Academia Sinica Peking, People's Republic of China. Acta Mathematica Sinica contains current research in all fields of pure mathematics. Volume 1, 1960 will have three issues (issue no. 1 published July, 1962); volume 2 four issues. It will appear quarterly or as published. Subscription price per volume \$20.00.

CONTENTS

Vol. 13, No. 4

AUGUST, 1962

Whole No. 76

	Page
Absolute F_σ -spaces. By A. H. STONE.....	495
Generating reflections for $U(2, p^{2n})$. By D. W. CROWE.....	500
Algebraic topology criteria for minimal sets. By HSIN CHU.....	503
A note on cohomology addition. By P. E. CONNER.....	509
On complete Bergman metrics. By SHOSHICHI KOBAYASHI.....	511
Test spaces for normal spaces. By B. H. McCANDLESS.....	514
On duality in proximity spaces. By S. LEADER.....	518
Certain Hadamard designs. By P. KESAVA MENON.....	524
Decomposability of modules. By IRVING KAPLANSKY.....	532
Arithmetical notes. VIII. An asymptotic formula of Rényi. By ECKFORD COHEN	536
Theorems on direct sums of modules. By CHIN-SHUI HSÜ.....	540
On pseudo-simple universal algebras. By DONALD MONK.....	543
A note on finite fields. By L. CARLITZ.....	546
On quasi-decompositions of torsion free Abelian groups. By J. D. REID.....	550
Local varieties and asymptotic equivalence. By H. T. MUHLY.....	555
Maximal subfields of an algebraically closed field not containing a given element. By FRANK QUIGLEY.....	562
Embedding numbers for finite groups. By JOHN ERNEST.....	567
Some results on doubly stochastic matrices. By MARVIN MARCUS	
and HENRYK MINC.....	571
Cardinality of level sets of Rademacher series whose coefficients form a geometric progression. By W. A. BEYER.....	579
Convolutions of Schlicht functions. By M. S. ROBERTSON.....	585
Self-adjoint Toeplitz operators and associated orthonormal functions.	
By MARVIN ROSENBLUM.....	590
A limit theorem for the fractional parts of the sequence $\{2^k t\}$. By Z. CIESIELSKI	
and H. KESTEN.....	596
A stability criterion for Hill's equation. By HARRY HOCHSTADT.....	601
Comparison theorems for linear differential equations of second order. By	
WALTER LEIGHTON.....	603
Output completeness in sequential machines. By G. F. ROSE.....	611
Upper and lower bounds of the norm of solutions of differential equations. By	
V. LAKSHMIKANTHAM.....	615
Geometrical properties of equipotential surfaces. By J.-P. KAHANE.....	617
Über die extremalen Polynome eines durch zwei Knoten unterteilten Kreises.	
By B. GERMANSKY.....	619
On redundancy of powers and the moment problem. By D. S. GREENSTEIN.....	625
Direct decompositions of lattices of continuous functions. By R. L. BLAIR and	
C. W. BURRILL.....	631
Generalized local integrability. By ROBERT WELLAND.....	635
On asymptotic occupancy times of the Wiener process. By MALCOLM GOLDMAN	
On a theorem by I. Glicksberg. By A. E. NUSSBAUM.....	640
"Flexible" predicates of formal number theory. By S. A. KRIPKE.....	645
Strong convergence in a product space. By JAMES SERRIN.....	647
On the basis problem in normed spaces. By M. M. DAY.....	651
On the classification of periodic flows. By G.-C. ROTA.....	655

SHORTER NOTES

Short proof of a theorem of Wintner on asymptotic integrations of the adiabatic oscillator. By R. B. KELMAN.....	663
Remark on $\pi(x) = o(x)$. By S. E. MAMANGAKIS.....	664
An inequality for nonnegative entire functions. By R. P. BOAS, JR.....	666
Representations of Banach spaces. By G. S. YOUNG.....	667
On a result of Hadamard concerning the sign of the precession of a heavy symmetrical top. By J. B. DIAZ and F. T. METCALF.....	669