

Mathematics of Computation

Volume 22, Number 101

January, 1968

Published by the American Mathematical Society

PROVIDENCE, RHODE ISLAND

Editorial Committee

- EUGENE ISAACSON, Chairman, New York University, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, New York 10012
Assistant to the Chairman: CHARLOTTE W. JOHN
- C. W. CLENSHAW, Mathematics Division, National Physics Laboratory, Teddington, Middlesex, England
- AVRON DOUGLIS, Department of Mathematics, University of Maryland, College Park, Maryland 20740
- WALTER GAUTSCHI, Computer Sciences Department, Purdue University, Lafayette, Indiana 47907
- GENE H. GOLUB, Computer Science Department, Stanford University, Stanford, California 94305
- A. S. HOUSEHOLDER, Oak Ridge National Laboratory, Oak Ridge, Tennessee
- HEINZ O. KREISS, Computer Science Department, University of Uppsala, Uppsala, Sturegatan 4, Sweden
- PETER D. LAX, New York University, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, New York 10012
- Y. L. LUKE, Midwest Research Institute, Kansas City, Missouri 64110
- JAMES M. ORTEGA, Computer Science Center, University of Maryland, College Park, Maryland 20740
- HARRY POLACHEK, Research Division, U. S. Atomic Energy Commission, Washington, D. C. 20545
- DANIEL SHANKS, Naval Ship Research and Development Center, Washington, D. C. 20007
- J. W. WRENCH, JR., Naval Ship Research and Development Center, Washington, D. C. 20007

Information for Subscribers

The journal is published quarterly in one volume per year, with issues numbered serially since Volume 1, Number 1. The subscription price is \$16.00. All back volumes are available. For Volumes 1-21 (1943-1967), prices are \$20.00 per volume and \$6.00 per issue.

Unpublished Mathematical Tables

The editorial office of the journal maintains a repository of Unpublished Mathematical Tables (UMT). When a table is deposited in the UMT repository a brief summary of its contents is published in the section *Reviews and Descriptions of Tables and Books*. Upon request, the chairman of the editorial committee will supply copies of any table for a nominal cost.

Subscriptions, address changes, business communications and payments should be sent to:

AMERICAN MATHEMATICAL SOCIETY
P. O. Box 6248
Providence, Rhode Island 02904

Copyright © 1968, American Mathematical Society

Reprinted 1970

Mathematics of Computation

A Quarterly Journal

Edited by

EUGENE ISAACSON, Chairman

C. W. CLENSHAW

AVRON DOUGLIS

WALTER GAUTSCHI

GENE H. GOLUB

A. S. HOUSEHOLDER

HEINZ O. KREISS

PETER D. LAX

Y. L. LUKE

JAMES M. ORTEGA

HARRY POLACHEK

DANIEL SHANKS

J. W. WRENCH, JR.

XXII

NOS. 101-104

1968

Mathematics of Computation

TABLE OF CONTENTS

JANUARY 1968

On Difference Approximations with Wrong Boundary Values HEINZ-OTTO KREISS & EINAR LUNDQVIST	1
On Numerical Calculation of Transonic Flow Patterns S. BERGMAN, J. G. HERRIOT & T. G. KURTZ	13
Finite-Difference Methods for Nonlinear Hyperbolic Systems A. R. GOURLAY & J. LL. MORRIS	28
Explicit $O(h^2)$ Bounds on the Eigenvalues of the Half- L Estimating Optimum Overrelaxation Parameters BLAIR K. SWARTZ L. A. HAGEMAN & R. B. KELLOGG	40
Interpolation and Quadrature Methods for Ordinary Differential Equations G. J. COOPER	69
A Special Case of the Filon Quadrature Formula . . . LLOYD D. FOSDICK	77
Error Estimates for Gauss Quadrature Formulas for Analytic Functions M. M. CHAWLA & M. K. JAIN	82
Asymptotic Error Estimates for the Gauss Quadrature Formula M. M. CHAWLA & M. K. JAIN	91
An Error Analysis for Numerical Multiple Integration. I. ROBERT E. BARNHILL	98
The Use of the Hypercircle Inequality in Deriving a Class of Numerical Approximation Rules for Analytic Functions . . . RICHARD A. VALENTIN	110
The Lawson Algorithm and Extensions . . . JOHN R. RICE & KARL H. USOW	118
A Rational Approximation to the Logarithm R. P. KELISKY & T. J. RIVLIN	128
On the Evaluation of Integrals Related to the Error Function C. CHIARELLA & A. REICHEL	137
On the Calculation of the Inverse of the Error Function ANTHONY J. STRECOK	144
The Incomplete Beta Function and its Ratio to the Complete Beta Function DAVID OSBORN & RICHARD MADEY	159
Zeros of Sections of the Zeta Function. II. ROBERT SPIRA	163
On Designs of Maximal $(+1, -1)$ -Matrices of Order $n \equiv 2 \pmod{4}$ C. H. YANG	174
Amicable Numbers and the Bilinear Diophantine Equation ELVIN J. LEE	181
Numerical Evaluation of an Isoperimetric Constant Z. A. MELZAK	188
TECHNICAL NOTES AND SHORT PAPERS	
Proof that Every Integer $\leq 452, 479, 659$ is a Sum of Five Numbers of the Form $Q_x \equiv (x^3 + 5x)/6, x \geq 0$ HERBERT E. SALZER & NORMAN LEVINE	191
A Map-Folding Problem W. F. LUNNON	193
The Maxima of $P_r(n_1, n_2)$ M. S. CHEEMA & H. GUPTA	199
A New Approximation Related to the Error Function W. R. SCHUCANY & H. L. GRAY	201

Improvement in Recurrence Techniques for the Computation of Bessel Functions of Integral Order	FR. MECHEL	202
The Zeros of $P_\nu^1(\cos \theta)$ and $(\partial/\partial\theta)P_\nu^1(\cos \theta)$	PETER H. WILCOX	205
Substitution Formulas for Laplace Transformations	R. G. BUSCHMAN	209
REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS		212
GUTTER, KUDRYAVTSEF & LEVITAN 1, COLLATZ 2, WEEG & REED 3, COLLATZ & WETTERLING 4, WARMUS 5, BELLMAN, KALABA & LOCKETT 6, VOROBYEV 7, MOORE 8, BABUSKA, PRAGER & VITASEK 9, STAKGOLD 10, BABISTER 11, LAL 12, SHIPLEY 13, SHIPLEY 14, MAGNUS OBERHETTINGER, SONI 15, KHAMIS 16, WEIL, MURTY & RAO 17, FETTIS & CASLIN 18, BELIAKOV, KRAVTSOVA & RAPPAPORT 19, LAL 20, JONES 21, JONES 22, LAL & DAWE 23, HARTMANIS & STEARNS 24, BATES & DOUGLAS 25, BAUER, PELUSO & WORLEY 26, LECHT 27, SMITH 28, THATCHER & CAPUTO 29, WEINBERG 30, HINTZE 31, BORK 32, BURCKHARDT 33, HOLLINGDALE 34		
TABLE ERRATA		244
ABRAMOWITZ & STEGUN 418, ANEMA & MIKSA 419, PONOMARENKO 420		
CORRIGENDA		246
BALLESTER & PEREYRA, SHANKS & WRENCH, FAIRWEATHER & GOURLAY		
NOTES		248
NEW PRINTINGS		
ADDENDUM		249

Information for Contributors

Manuscripts should be typewritten double-spaced in the format used by the journal. For journal abbreviations, see *Mathematical Reviews*, v. 28, Index. An author should submit the original and one copy of the manuscript and retain one copy. The author may suggest an appropriate editor for his paper. It is recommended that the author acquaint himself with the pertinent material contained in "Information for Contributors to Mathematics of Computation" and "Manual for Authors," both of which are available upon request from the American Mathematical Society. All contributions intended for publication and all books for review should be addressed to Eugene Isaacson, Chairman, Editorial Committee, Mathematics of Computation, New York University, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, New York 10012. Institutions sponsoring research reported in the journal are assessed page charges.

Microcard Edition

Volumes 1-14 (1943-1960) are available on Microcards at \$39.00 for the complete set and may be purchased from Microcard Editions, Inc., 901 26th Street N. W., Washington, D. C. 20037.