# Mathematical Tables 

## and other

# Aids to Computation 

A Quarterly Journal
Edited by

E. W. CANNON<br>F. J. MURRAY<br>C. C. CRAIG<br>J. TODD<br>A. ERDÉLYI<br>D. H. LEHMER, Chairman

VIII • Number 48 - October, 1954 - p. 189-256

Published by
THE NATIONAL RESEARCH COUNCIL Washington, D. C.

# NATIONAL RESEARCH COUNCIL <br> Division of Mathematics 

## EDITORIAL COMMITTEE

E. W. Cannon (E.W.C.), National Bureau of Standards, Washington, D. C. Automatic Computing Machinery [ACM].<br>C. C. Craig (C.C.C.), University of Michigan, Ann Arbor, Mich. Mathematical Statistics [K].<br>A. Erdélyi (A.E.), California Institute of Technology, Pasadena, Calif. Higher Mathematical Functions [L].<br>F. J. Murray (F.J.M.), Columbia University, New York, N. Y. Other Aids to Computation [OAC].<br>J. Todd (J.T.), National Bureau of Standards, Washington, D. C. Numerical Methods.<br>D. H. Lehmer (D.H.L.), Chairman, University of California, Berkeley, Calif.

## SUBSCRIPTION RATES

1943-1945: (Nos. 1-12) $\$ 12.00$ for all 12 issues (not available for separate sale except as noted below*)
1946-1949: \$4.00 per year
1950-1954: \$5.00 per year
Single issues are available for sale as follows:

* 1944 (No. 7, "A Guide to Tables of Bessel Functions," by H. Bateman and R. C. Archibald, 104 pp.) $\$ 2.00$

1946-1949 (Nos. 13-28) \$1.25 for single issue
1950-1954 (Nos. 29-48) \$1.50 for single issue
N.R.C. Bulletin 105, Guide to Tables in the Theory of Numbers, $\$ 2.50$.

All payments are to be made to National Academy of Sciences, 2101 Constitution Avenue, Washington, D. C.

Agents for Great Britain and Ireland (subscription 42s, $6 d$ for 1954) Scientific Computing Service, Ltd., 23 Bedford Square, London W.C.1.

[^0]
# Mathematical Tables 

 and other Aids to ComputationA Quarterly Journal

Edited by

E. W. CANNON<br>F. J. MURRAY<br>C. C. CRAIG<br>J. TODD<br>A. ERDÉLYI<br>D. H. LEHMER, Chairman

## VIII

nos. 45-48
1954

Published by
THE NATIONAL RESEARCH COUNCIL Washington, D. C.

## CLASSIFICATION OF TABLES

A. Arithmetical Tables, Mathematical Constants
B. Powers
C. Logarithms
D. Circular Functions
E. Hyperbolic and Exponential Functions
F. Theory of Numbers
G. Higher Algebra
H. Numerical Solution of Equations
I. Finite Differences Interpolation
J. Summation of Series
K. Statistics
L. Higher Mathematical Functions
M. Integrals
N. Interest and Investment
O. Actuarial Science
P. Engineering
Q. Astronomy
R. Geodesy
S. Physics, Geophysics, Crystallography
T. Chemistry
U. Navigation
V. Aerodynamics, Hydrodynamics, Ballistics
Z. Calculating Machines and Mechanical Computation

## CONTENTS

## October 1954

A Generalization of the Method of Conjugate Gradients for Solving Systems of Linear Algebraic Equations J. H. Curtiss ..... 189
On the Estimation of Quadrature Errors for Analytic Functions P. Davis \& P. Rabinowitz ..... 193
Integrals Occurring in Problems of Molecular Structure. .A. Dalgarno ..... 203
Characters of the Symmetric Groups of Degree 15 and 16.... Robert L. Bivins, N. Metropolis, Paul R. Stein \& Mark B. Wells ..... 212
Recent Mathematical Tables ..... 216Admiralty Research Lab. 1245, Bates, Ledsham \& Stewart1246, Caldwell 1237, Chandrasekhar \& Elbert 1247, Dunski1248, Fröberg \& Rabinowitz 1249, Gumbel 1238, Gupta, Cheema\& Gupta 1236, Hamaker 1239, Hammersley 1250, Hirvonen 1235,Johnson 1240, Lotkin \& Young 1234, Muggia 1251, Olsson1252, Rand 1241, Rosenbaum 1242, Slater 1253, 1254, Solomon1243, Sternberg 1255, Taguti 1244, Walther \& Unger 1256,Wilkes 1257.
Mathematical Tables-Errata ..... 227
Blakesley 240, Mahalanobis 241.
Unpublished Mathematical Tables ..... 228
Bivins, Metropolis, Stein \& Wells 195, Ferrier 192, Miksa 191, 193, 194, Natrella 196, Opler 197.
Automatic Computing Machinery Bibliography of Coding Procedure ..... 230
Bibliography Z: Gray, Jr. 1147, Householder 1148, Knight 1149, Pearcey 1150, Saunders 1151. News ..... 233
Other Aids to Computation ..... 233
A Useful Technique in Programming for Analog Computers
J. E. Maxfield ..... 233Bibliography Z: Amitsur, Oppenheim \& Many 1152, Anderson\& Rudnick 1153, Barber 1154, Boas 1155, Brown \& Schwetman1156, Brownell, Cavicchi \& Perry 1157, Cambel \& Schneider1158, Cederbaum 1159, Crumb, Jr. 1160, Ludeke \& Evans 1161,McDonal 1162, Macnee 1163, Ragazzini \& Reynolds 1164,Tadayon 1165.
Notes ..... 237
168. A Practical Refutation of the Iteration Method for the Alge- braic Eigenproblem E. Bodewig ..... 237
169. Analytical Approximations E. E. Allen ..... 240
170. A Sieve Problem on "Pseudo-squares" D. H. Lehmer ..... 241
171. L. F. Richardson (1881-1953) John Todd ..... 242
Corrigenda ..... 245
Indices. ..... 246


[^0]:    Published quarterly in January, April, July and October by the National Research Council, Prince and Lemon Sts., Lancaster, Pa., and Washington, D. C.
    All contributions intended for publication in Mathematical Tables and Other Aids to Computation, and all Books for review, should be addressed to C. B. Tompkins, Numerical Analysis Research, 405 Hilgard Ave., Los Angeles 24, California.
    Entered as second-class matter July 29, 1943, at the post office at Lancaster, Pennsylvania, under the Act of August 24, 1912.

