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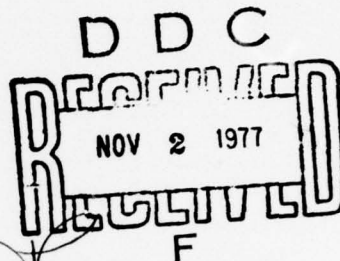
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by

David V. Sommer

&

Sharon E. Good



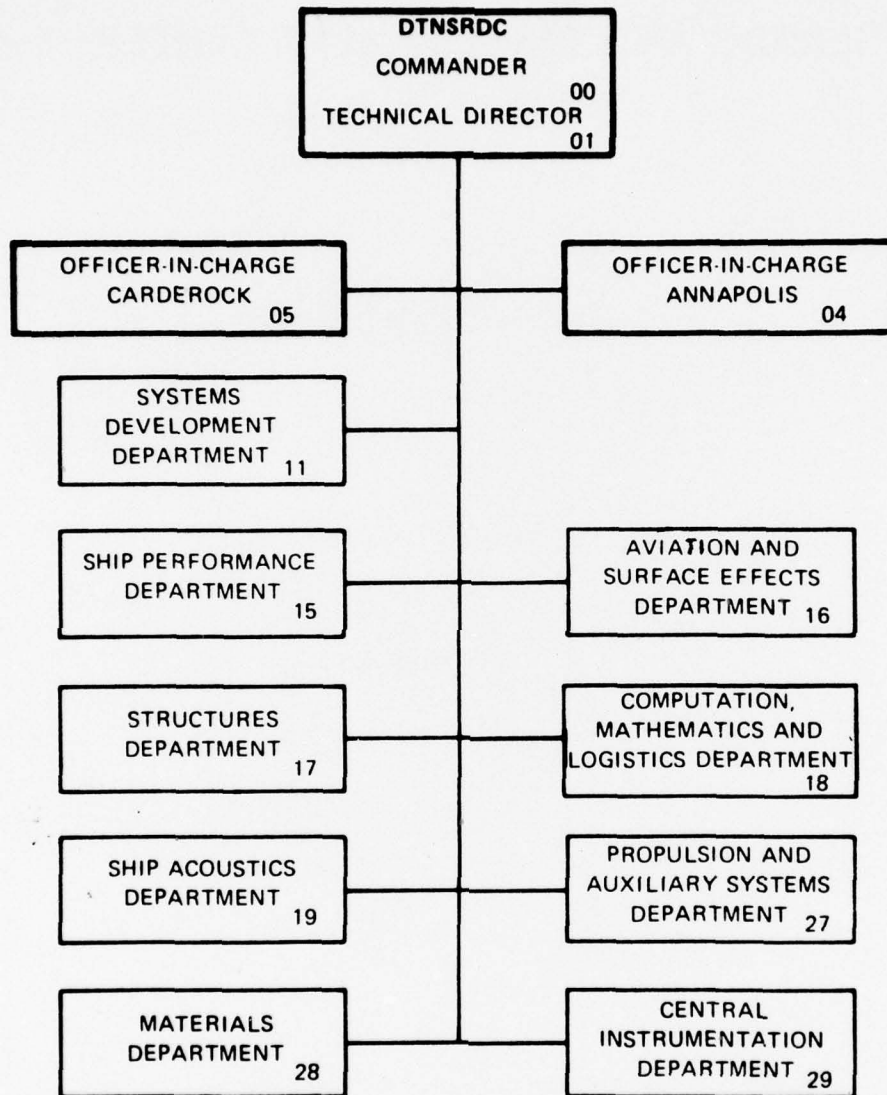
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Computer Center Libraries (CCLIB) Manual is a cross reference volume for many subprograms, programs, utilities and procedures available at the DTNSRDC Computer Center. CCLIB lists the routines by functional category and alphabetically, by libraries, with descriptive title.		

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***** INTRODUCTION *****

THE COMPUTER CENTER MAKES AVAILABLE, IN ADDITION TO THE NOS/BE OPERATING SYSTEM, A WIDE VARIETY OF BOTH SCIENTIFIC AND UTILITY PROGRAMS, SUBPROGRAMS AND CATALOGUED PROCEDURES. MOST OF THE ROUTINES ARE MAINTAINED IN LIBRARIES ON PERMANENT FILES AND MAY BE INVOKED BY THE APPROPRIATE (LOADER) CONTROL CARDS. A FEW PROGRAMS ARE AVAILABLE AS INDEPENDENT PERMANENT FILES.

THE CCLIB-SERIES OF MANUALS CONTAINS THE FOLLOWING, WHICH DESCRIBE THE CONTENTS OF THE VARIOUS LIBRARIES MAINTAINED BY THE COMPUTER CENTER:

CCLIB	- COMPUTER CENTER LIBRARIES	CMLD-77-12
CCLIB/N	- COMPUTER CENTER LIBRARIES/NSRDC (SUBPROGRAMS)	CMLD-77-15
CCLIB/P	- COMPUTER CENTER LIBRARIES/PROFIL (PROCEDURES)	CMLD-77-16
CCLIB/U	- COMPUTER CENTER LIBRARIES/UTILITY (PROGRAMS)	CMLD-77-17
CCLIB/M	- COMPUTER CENTER LIBRARIES/MNSRDC (PROGRAMS)	

THIS MANUAL, CCLIB, IS A CROSS-REFERENCE MANUAL WHICH DESCRIBES ALL THE LIBRARIES AND INDICATES A SOURCE FOR MORE COMPLETE DOCUMENTATION ON HOW TO USE THE ROUTINES IN THE LIBRARIES. REFERENCES MAY BE TO OTHER PUBLISHED BOOKS, MACHINE-READABLE DOCUMENTATION OR MASTER COPIES ON FILE IN USER SERVICES. THE OTHER MANUALS IN THIS SERIES CONTAIN MACHINE-READABLE DOCUMENTS.

ALL REFERENCE MATERIAL IS AVAILABLE FOR PERUSAL IN USER SERVICES (CARDECK: BLDG 17, ROOM 100, (202) 227-1907; ANNAPOLIS: BLDG 100, ROOM 2-J, (301) 267-3343). COPIES OF THE CCLIB-SERIES MAY BE OBTAINED FROM USER SERVICES.

*** HOW TO USE THIS MANUAL ***

THE ROUTINES ARE CLASSIFIED IN ONE OR MORE FUNCTIONAL CATEGORIES (SEE PAGE 1-3 FOR A LIST OF CATEGORIES). THEY ARE LISTED, BEGINNING ON PAGE 1-6, UNDER THE VARIOUS CATEGORIES. EACH ENTRY IN THIS LIST INDICATES THE TYPE OF ROUTINE, THE LIBRARY (IF ANY) WHERE IT MAY BE FOUND, AND THE LOCATION OF THE DETAILED DOCUMENT WHICH DESCRIBES ITS USE.

THE ROUTINES LISTED IN THIS MANUAL ARE DIVIDED BY TYPE (PROGRAM, SUBPROGRAM OR CATALOGUED PROCEDURE), IN CHAPTERS 2, 3 AND 4, RESPECTIVELY. THESE CHAPTERS DESCRIBE THE VARIOUS LIBRARIES AVAILABLE AND LIST THE ROUTINES IN EACH LIBRARY (WITH A DESCRIPTIVE TITLE) ALPHABETICALLY.

*** HOW TO PRINT INDIVIDUAL DOCUMENTS ***

INDIVIDUAL DOCUMENTS FOR MANY ROUTINES MAY BE PRINTED BY ONE OF THE FOLLOWING:

1) FOR LIBRARIES NSRDC, PROFIL, UTILITY, MNSRDC, OTHER*:

JOBNAME,....
CHARGE,....
BEGIN,UTILITY,,PROGDOC,<LIBRARY>,,<ROUTINE>,OUTPUT.

2) FOR LIBRARIES ARLNALG, EISPACK, FUNPACK, IMSL:

JOBNAME,MT1,....
CHARGE,....
BEGIN,DOCTAPE,,<LIBRARY>,<ROUTINE>,OUTPUT.

WHERE <LIBRARY> IS THE LIBRARY CONTAINING THE ROUTINE
<ROUTINE> IS THE NAME OF THE ROUTINE WHOSE DOCUMENTATION IS
DESIRED.

* - PSEUDO-LIBRARY 'OTHER' IS A COLLECTION OF MISCELLANEOUS DOCUMENTS
NOT PRINTED IN ANY MANUAL (SEE PAGE 2-11).

*** FUNCTIONAL CATEGORIES ***

THE FOLLOWING FUNCTIONAL CATEGORIES ARE USED AT DTNSRDC. THOSE PRECEDED BY AN ASTERISK (*) ARE LOCAL DTNSRDC CATEGORIES. ALL OTHERS ARE FROM THE VIM (THE CDC USERS GROUP) LIST.

- A0 ARITHMETIC ROUTINES
- A1 REAL NUMBERS
- A2 COMPLEX NUMBERS
- A3 DECIMAL
- A4 I/O ROUTINES

- B0 ELEMENTARY FUNCTIONS
- B1 TRIGONOMETRIC
- B2 HYPERBOLIC
- B3 EXPONENTIAL AND LOGARITHMIC
- B4 ROOTS AND POWERS

- C0 POLYNOMIALS AND SPECIAL FUNCTIONS
- C1 EVALUATION OF POLYNOMIALS
- C2 ROOTS OF POLYNOMIALS
- C3 EVALUATION OF SPECIAL FUNCTIONS (NON-STATISTICAL)
- C4 SIMULTANEOUS NON-LINEAR ALGEBRAIC EQUATIONS
- C5 SIMULTANEOUS TRANSCENDENTAL EQUATIONS
- * C6 ROOTS OF FUNCTIONS

- D0 OPERATIONS ON FUNCTIONS AND SOLUTIONS OF DIFFERENTIAL EQUATIONS
- C1 NUMERICAL INTEGRATION
- D2 NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS
- D3 NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS
- D4 NUMERICAL DIFFERENTIATION

- E0 INTERPOLATION AND APPROXIMATIONS
- E1 TABLE LOOK-UP AND INTERPOLATION
- E2 CURVE FITTING
- E3 SMOOTHING
- E4 MINIMIZING OR MAXIMIZING A FUNCTION

- F0 OPERATIONS ON MATRICES, VECTORS & SIMULTANEOUS LINEAR EQUATIONS
- F1 VECTOR AND MATRIX OPERATIONS
- F2 EIGENVALUES AND EIGENVECTORS
- F3 DETERMINANTS
- F4 SIMULTANEOUS LINEAR EQUATIONS

- G0 STATISTICAL ANALYSIS AND PROBABILITY
- G1 DATA REDUCTION (COMMON STATISTICAL PARAMETERS)
- G2 CORRELATION AND REGRESSION ANALYSIS
- G3 SEQUENTIAL ANALYSIS
- G4 ANALYSIS OF VARIANCE
- G5 TIME SERIES
- G6 SPECIAL FUNCTIONS (INCLUDES RANDOM NUMBERS AND PDF'S)
- * G7 MULTIVARIATE ANALYSIS AND SCALE STATISTICS
- * G8 NON-PARAMETRIC METHODS AND STATISTICAL TESTS
- * G9 STATISTICAL INFERENCE

H0 OPERATIONS RESEARCH TECHNIQUES, SIMULATION & MANAGEMENT SCIENCE
H1 LINEAR PROGRAMMING
H2 NON-LINEAR PROGRAMMING
H3 TRANSPORTATION AND NETWORK CODES
H4 SIMULATION MODELING
H5 SIMULATION MODELS
H6 CRITICAL PATH PROGRAMS
H8 AUXILIARY PROGRAMS
H9 COMBINED

I0 INPUT
I1 BINARY
I2 OCTAL
I3 DECIMAL
I4 BCD (HOLLERITH)
I9 COMPOSITE

J0 OUTPUT
J1 BINARY
J2 OCTAL
J3 DECIMAL
J4 BCD (HOLLERITH)
J5 PLOTTING
J7 ANALOG
J9 COMPOSITE

K0 INTERNAL INFORMATION TRANSFER
K1 EXTERNAL-TO-EXTERNAL
K2 INTERNAL-TO-INTERNAL (RELOCATION)
K3 DISK
K4 TAPE
K5 DIRECT DATA DEVICES

L0 EXECUTIVE ROUTINES
L1 ASSEMBLY
L2 COMPILING
L3 MONITORING
L4 PREPROCESSING
L5 DISASSEMBLY AND DERELATIVIZING
L6 RELATIVIZING
L7 COMPUTER LANGUAGE TRANSLATORS

M0 DATA HANDLING
M1 SORTING
M2 CONVERSION AND/OR SCALING
M3 MERGING
M4 CHARACTER MANIPULATION
M5 SEARCHING, SEEKING, LOCATING
M6 REPORT GENERATORS
M9 COMPOSITE

N0 DEBUGGING
N1 TRACING AND TRAPPING
N2 DUMPING
N3 MEMORY VERIFICATION AND SEARCHING
N4 BREAKPOINT PRINTING

C0 SIMULATION OF COMPUTERS AND DATA PROCESSORS (INTERPRETERS)
C1 OFF-LINE EQUIPMENT (LISTERS, REPRODUCERS, ETC.)
C3 COMPUTERS
C4 PSEUDO-COMPUTERS
C5 SOFTWARE SIMULATION OF PERIPHERALS
C9 COMPOSITE

P0 DIAGNOSTICS (HARDWARE MALFUNCTION)

Q0 SERVICE OR HOUSEKEEPING, PROGRAMMING AIDS
Q1 CLEAR/RESET
Q2 CHECKSUM ACCUMULATION AND CORRECTION
Q3 FILE MANIPULATION
Q4 INTERNAL HOUSEKEEPING, SAVE, RESTORE, ETC.
Q5 REPORT GENERATOR SUBROUTINES
Q6 PROGRAM DOCUMENTATION: FLOW CHARTS, DOCUMENT STANDARDIZATION
Q7 PROGRAM LIBRARY UTILITIES

R0 LOGIC AND SYMBOLIC
R1 FORMAL LOGIC
R2 SYMBOL MANIPULATION
R3 LIST AND STRING PROCESSING
R4 TEXT EDITING

S0 INFORMATION RETRIEVAL

T0 APPLICATIONS AND APPLICATION-ORIENTED PROGRAMS
T1 PHYSICS (INCLUDING NUCLEAR)
T2 CHEMISTRY
T3 OTHER PHYSICAL SCIENCES (GEOLOGY, ASTRONOMY, ETC.)
T4 ENGINEERING
T5 BUSINESS DATA PROCESSING
T6 MANUFACTURING (NON-DATA) PROCESSING AND PROCESS CONTROL
T7 MATHEMATICS AND APPLIED MATHEMATICS
T8 SOCIAL AND BEHAVIORAL SCIENCES AND PSYCHOLOGY
T9 BIOLOGICAL SCIENCES
T10 REGIONAL SCIENCES (GEOGRAPHY, URBAN PLANNING)
T11 COMPUTER ASSISTED INSTRUCTION

U0 LINGUISTICS AND LANGUAGES

V0 GENERAL PURPOSE UTILITY SUBROUTINES
V1 RANDOM NUMBER GENERATORS
V2 COMBINATORIAL GENERATORS: PERMUTATIONS, COMBINATIONS & SUBSETS
* V3 STANDARD AND SPECIAL PROBLEMS

X0 DATA REDUCTION
X1 RE-FORMATTING, DECOMMUTATION, ERROR DIAGNOSIS
X2 EDITING
X3 CALIBRATION
X4 EVALUATION
X5 ANALYSIS (TIME-SERIES ANALYSIS)
X6 SIMULATION (GENERATE TEST DATA FOR DATA REDUCTION SYSTEM)

Y0 INSTALLATION MODIFICATION
Y1 INSTALLATION MODIFICATION LIBRARY
Y2 NEWPL TAPE OF INSTALLATION MODIFICATIONS

Z0 ALL OTHERS

*** LIST OF ROUTINES BY FUNCTIONAL CATEGORY ***

THE FOLLOWING IS A LIST OF ROUTINES DISCUSSED IN THE CCLIB SERIES OF MANUALS. EACH ROUTINE APPEARS UNDER THE CATEGORY(IES) TO WHICH IT HAS BEEN ASSIGNED.

EACH ENTRY HAS THE FOLLOWING FORM:

NAME/TYPE/LIB/DOC/

WHERE NAME IS THE ROUTINE NAME
(MAY BE ABBREVIATED TO FIT INTO 7 CHARACTERS (SPSS))

TYPE IS THE KIND OF ROUTINE
D - MAIN PROGRAM ACTIVATED BY A DATA CARD (SPSS, COMRADE)
M - MAIN PROGRAM
P - PROCEDURE
S - SUBPROGRAM

LIB IS THE LIBRARY CONTAINING THE ROUTINE
(THE NUMBER IN PARENTHESES FOLLOWING EACH LIBRARY NAME BELOW IS THE PAGE IN THIS MANUAL WHERE THE LIBRARY IS DISCUSSED)

A - ARLNALG (3-2)
B - RIMED (2-1)
C - BIMEOP (2-3)
D - EDSTAT (3-4)
E - EISPACK (3-6)
F - FUNPACK (3-10)
I - IMSL (3-12)
M - MSL (3-34)
N - NSRDC (3-54)
P - PROFIL (4-1)
R - MNSRDC (2-4)
S - SPSS (2-5)
U - UTILITY (2-7)
BLANK - NOT IN A LIBRARY

DOC INDICATES THE MANUAL WHERE THE ROUTINE IS DOCUMENTED
M - CCLIB/MNSRDC (PROGRAMS)
N - CCLIB/NSRDC (SUBPROGRAMS)
P - CCLIB/PROFIL (PROCEDURES)
R - CCRM (COMPUTER CENTER REFERENCE MANUAL)
(MAY CONTAIN ENOUGH INFORMATION TO USE THE ROUTINE OR A FURTHER REFERENCE.)
U - CCLIB/UTILITY (PROGRAMS)
* - USER SERVICES HAS THE DOCUMENT
BLANK - FOR DOCUMENTATION LOCATION, SEE THE DISCUSSION OF THAT LIBRARY IN THIS MANUAL

A0	ARITHMETIC ROUTINES		
	FAFRAC /S/M/ /	HCF /S/M/ /	VDCPS /S/I/ /
	FFRAC /S/M/ /	ICOMN /S/N/*/	XOR /S/N/*/
	FHFRAC /S/M/ /	LCM /S/M/ /	
A1	REAL NUMBERS		
	AMCON /S/M/ /	NFILL /S/N/N/	
	ISUMIT /S/N/N/	SUMIT /S/N/N/	
A2	COMPLEX NUMBERS		
	CADR /S/M/ /	COMBES /S/M/ /	MULLP /S/M/ /
	CBAREX /S/M/ /	CPDIV /S/M/ /	POLYMUL /M/R/M/
	CCOMPE /S/M/ /	CPOLRT /S/M/ /	PSI /S/N/*/
	CCONGR /S/M/ /	CPTRAN /S/M/ /	SUBDIA /S/M/ /
	CDERIV /S/M/ /	CQDIV /S/M/ /	VALVEC /S/M/ /
	CFBSUM /S/M/ /	CREV /S/M/ /	VECORD /S/M/ /
	CGITRF /S/M/ /	CSBR /S/M/ /	ZAFUJ /S/M/ /
	CGLESM /S/M/ /	CSHRNK /S/M/ /	ZAFUM /S/M/ /
	CINPRD /S/M/ /	ELRH1C /S/I/ /	ZAFUR /S/M/ /
	CINT /S/M/ /	ELRH2C /S/I/ /	ZCOUNT /S/M/ /
	CITERF /S/M/ /	ELZHC /S/I/ /	ZCPOLY /S/I/ /
	CLODIV /S/M/ /	ELZVC /S/I/ /	ZQADC /S/I/ /
	CMPINV /S/N/N/	HARM /S/M/ /	ZQADR /S/I/ /
	CMPYR /S/M/ /	HELP /S/M/ /	
	CNSLVL /S/M/ /	HELP /S/N/N/	
B1	TRIGONOMETRIC		
	COTAN /S/N/*/	SICI /S/M/ /	
B3	EXPONENTIAL AND LOGARITHMIC		
	CBAREX /S/M/ /		
B4	ROOTS AND POWERS		
	DPROOT /S/N/N/	PROOT /S/N/N/	SUMPS /S/M/ /
C1	EVALUATION OF POLYNOMIALS		
	ADR /S/M/ /	CQDIV /S/M/ /	PARFAC /S/M/ /
	APOWR /S/N/*/	CREV /S/M/ /	PDIV /S/M/ /
	BPOWR /S/N/*/	CSBR /S/M/ /	POLDIV /S/N/*/
	CADR /S/M/ /	CSHRNK /S/M/ /	POWR1 /S/N/*/
	CCOMPE /S/M/ /	DERIV /S/M/ /	POWR2 /S/N/*/
	CDERIV /S/M/ /	EVREAL /S/M/ /	PROD2 /S/N/*/
	CLODIV /S/M/ /	FMULT1 /S/M/ /	PTRAN /S/M/ /
	CMPYR /S/M/ /	HIFAC /S/N/*/	QDIV /S/M/ /
	CNSLVL /S/M/ /	IBCEVU /S/I/ /	REV /S/M/ /
	COMPEV /S/M/ /	ICSEVU /S/I/ /	SBR /S/M/ /
	COSEVL /S/M/ /	LOIV /S/M/ /	SHRINK /S/M/ /
	CPDIV /S/M/ /	MPYR /S/M/ /	SINEVL /S/M/ /
	CPTRAN /S/M/ /	NSLVL /S/M/ /	
C2	ROOTS OF POLYNOMIALS		
	CINT /S/M/ /	MULLP /S/M/ /	ZCPOLY /S/I/ /
	CPOLRT /S/M/ /	NROOTS /S/N/*/	ZPOLR /S/I/ /
	DPROOT /S/N/N/	POLYMUL /M/R/M/	ZQADC /S/I/ /
	HELP /S/M/ /	PROOT /S/M/ /	ZQADR /S/I/ /
	HELP /S/N/N/	PROOT /S/N/N/	ZRPOLY /S/I/ /
	INT /S/M/ /	QUART /S/N/*/	

C3 EVALUATION OF SPECIAL FUNCTIONS (NON-STATISTICAL)

AI /S/N/*/	DAW /S/F/ /	MERFC /S/I/ /
BFJV0 /S/N/*/	EI /S/F/ /	MERFCI /S/I/ /
BEJY1 /S/N/*/	ELF /S/M/ /	MERFI /S/I/ /
9ESEI0 /S/F/ /	ELIEM /S/F/ /	MGAMMA /S/I/ /
9ESEI1 /S/F/ /	ELIE1 /S/F/ /	MLGAMA /S/I/ /
BESEK0 /S/F/ /	ELIKM /S/F/ /	MMBSI0 /S/I/ /
BESEK1 /S/F/ /	ELIK1 /S/F/ /	MMBSI1 /S/I/ /
BESIO /S/F/ /	ELIPE /S/F/ /	MMBSJ0 /S/I/ /
BESI1 /S/F/ /	ELIPK /S/F/ /	MMBSJ1 /S/I/ /
BESJ0 /S/F/ /	ELK /S/M/ /	MMBSK0 /S/I/ /
BESJ1 /S/F/ /	ELLI /S/N/*/	MMBSK1 /S/I/ /
BESK0 /S/F/ /	ELLIP /S/N/*/	MMBSYN /S/I/ /
BESK1 /S/F/ /	EL3 /S/M/ /	MMDAW /S/I/ /
BESNIS /S/M/ /	EONE /S/F/ /	MMDEI /S/I/ /
BESNKS /S/M/ /	ERF /S/M/ /	MMDELE /S/I/ /
BESST /S/N/*/	ERF /S/N/*/	MMDELK /S/I/ /
BESSJ /S/N/*/	ERFINV /S/M/ /	MMKELD /S/I/ /
BESSK /S/N/*/	ERROR /S/N/*/	MMKELO /S/I/ /
BESSY /S/N/*/	EXPEI /S/F/ /	MMKEL1 /S/I/ /
BFSY /S/F/ /	EXPINT /S/N/*/	MNDRI5 /S/I/ /
BSJ /S/M/ /	FRESNEL /S/N/N/	NBESJ /S/M/ /
BSJ /S/N/N/	GAMAIN /S/M/ /	PSI /S/F/ /
9BSF /S/N/*/	GAMCAR /S/N/N/	PSI /S/N/*/
CEI3 /S/N/*/	GAMMA /S/M/ /	RBESY /S/M/ /
CEL3 /S/M/ /	GAMMA /S/N/N/	SNCNDN /S/N/N/
CHEBEV /S/M/ /	HANKEL /S/M/ /	VCONVO /S/I/ /
CHTOL /S/M/ /	LOGGAM /S/M/ /	YNU /S/F/ /
COMBES /S/M/ /	LOGGAM /S/N/*/	
COMBES /S/N/*/	MERF /S/I/ /	

C4 SIMULTANEOUS NON-LINEAR ALGEBRAIC EQUATIONS

NEWT /S/M/ /	NRS6 /S/M/ /	RQNW7 /S/M/ /
NONLIQ /S/M/ /	QNWT /S/M/ /	ZSYSTEM /S/I/ /

C5 SIMULTANEOUS TRANSCENDENTAL EQUATIONS

QNWT /S/M/ /	RQNW7 /S/M/ /
--------------	---------------

C6 ROOTS OF FUNCTIONS

ROOTER /S/N/*/	ZANLYT /S/I/ /	ZREAL1 /S/I/ /
ZAFUJ /S/M/ /	ZBRENT /S/I/ /	ZREAL2 /S/I/ /
ZAFUM /S/M/ /	ZCOUNT /S/M/ /	
ZAFUR /S/M/ /	ZFALSE /S/I/ /	

D0 OPERATIONS ON FUNCTIONS AND SOLUTIONS OF DIFFERENTIAL EQUATIONS

PADE /S/M/ /	RATL /S/M/ /
--------------	--------------

D1 NUMERICAL INTEGRATION

DBCEVU /S/I/ /	LAGRAN /S/M/ /	SIMP /S/N/*/
DBCCDU /S/I/ /	LAGUER /S/M/ /	SIMPRC /S/M/ /
DCADRE /S/I/ /	LEGEND /S/M/ /	SIMPUN /S/N/*/
DCSQDU /S/I/ /	PARBL /S/M/ /	TRGINT /S/M/ /
FGI /S/N/*/	QUAD /S/M/ /	UNCSPL /S/M/ /
FNOL3 /S/N/*/	QUADG /S/N/N/	XFIL /S/N/*/
GMI /S/M/ /	ROMBG /S/M/ /	
HERMIT /S/M/ /	SICI /S/M/ /	

D2 NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS
 DASCUR /S/I/ / OVERK /S/I/ / FNOL3 /S/N/*/
 DREBS /S/I/ / DVOGER /S/I/ / KUTMER /S/N/N/

D3 NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS
 BLCKDQ /S/M/ / LINBVP /S/M/ / RKINIT /S/M/ /
 BVP /S/M/ / NRKVS /S/M/ /
 DRATEX /S/M/ / NRKVSH /S/M/ /

D4 NUMERICAL DIFFERENTIATION
 CDERIV /S/M/ / DERIV /S/M/ / LAGDIF /S/M/ /
 DCSEVU /S/I/ / DIFTAB /S/M/ / TRGDIF /S/M/ /

E0 INTERPOLATION AND APPROXIMATIONS
 COSEVL /S/M/ / SINEVL /S/M/ / ZSRCH /S/I/ /

E1 TABLE LOOK-UP AND INTERPOLATION
 AQFI /S/M/ / IBCIEU /S/I/ / SEARCH /S/M/ /
 AITKEN /S/M/ / ICSICU /S/I/ / SINER /S/M/ /
 ATSM /S/M/ / IOHSCU /S/I/ / TBLU1 /S/M/ /
 CRDTAB /S/N/* / IRATCU /S/I/ / TBLU2 /S/M/ /
 DISCOT /S/N/N/ LAGINT /S/M/ / TBLU3 /S/M/ /
 FRMRAN /S/N/* / NRICH /S/M/ / TERP1 /S/M/ /
 FRMRA2 /S/N/* / ORTHON /S/M/ / TERP2 /S/M/ /
 HRMT1 /S/M/ / PRICH /S/M/ / TERP3 /S/M/ /
 HRMT2 /S/M/ / RICH /S/M/ /

E2 CURVE FITTING
 BSUBHT /S/M/ / FFT2 /S/I/ / LSQHTS /S/M/ /
 CCONGR /S/M/ / FFT2RV /S/I/ / LSQSIT /S/M/ /
 CODECOM /S/M/ / FFT5 /S/N/* / LSQSUB /S/N/* /
 GFCME /S/M/ / FHRNEW /S/M/ / OPLSA /S/N/N/ /
 GHERAP /S/M/ / FITLIN /S/M/ / ORTHFT /S/M/ /
 GHEBEV /S/M/ / FLGNEW /S/M/ / PLAGR /S/M/ /
 COMCUB /S/M/ / FLSQFY /S/M/ / PLRG /M/R/M/ /
 CUBIC2 /S/M/ / FOUAP /S/M/ / POLYN /S/N/N/ /
 CURV /S/M/ / FOURI /S/M/ / PRONY /S/M/ /
 DIFTAB /S/M/ / GMHAS /S/N/* / RFFT /S/N/N/ /
 ECGM2 /S/M/ / GMI /S/M/ / RFSN /S/N/N/ /
 FCLSQ /S/M/ / IBCICU /S/I/ / SPLFIT /S/N/* /
 FOLSQ /S/M/ / ICSFKU /S/I/ / SPLINE /S/M/ /
 FFT /S/N/N/ ICSVKU /S/I/ / SQFIT /S/N/* /
 FFTP /S/I/ / ITRLsq /S/M/ / SURFS /S/M/ /
 FFTP /S/I/ / LSQHTM /S/M/ / UNCSP /S/M/ /

E3 SMOOTHING
 ICSSMOU /S/I/ / SIGSMT /S/M/ / SMOOTH /S/N/* /
 ICSSCU /S/I/ / SMOCUB /S/M/ /
 MILN2 /S/M/ / SMOOTH /S/M/ /

F4 MINIMIZING OR MAXIMIZING A FUNCTION
 MIGEN /S/M/ / MINRAT /S/M/ / ZXMIN /S/I/ /
 MINMAX /S/N/* / ZXFIB /S/I/ / ZXSSQ /S/I/ /

F1 VECTOR AND MATRIX OPERATIONS

AXBS /S/D/*/	LU3 /S/A/ /	VCVTFB /S/I/ /
BALANC /S/E/ /	LU4 /S/A/ /	VCVTFQ /S/I/ /
BALANC /S/M/ /	LU5 /S/A/ /	VCVTFS /S/I/ /
BANDR /S/E/ /	LU6 /S/A/ /	VCVTHC /S/I/ /
BCHSDG /S/M/ /	MATINS /S/N/N/	VCVTQF /S/I/ /
BDCWNP /S/M/ /	MINFIT /S/E/ /	VCVTQS /S/I/ /
BDECOM /S/M/ /	ORTHES /S/E/ /	VCVTSF /S/I/ /
BOTRGI /S/I/ /	ORTHO /S/A/ /	VCVTSQ /S/I/ /
BOTRGO /S/I/ /	ORTH02 /S/A/ /	VHSH2C /S/I/ /
BMD10S /M/B/ /	ORTRAN /S/E/ /	VHSH2R /S/I/ /
CRAL /S/E/ /	PROSUM /S/M/ /	VHSH3R /S/I/ /
CDECOM /S/M/ /	QZHES /S/E/ /	VIP /S/M/ /
CHSDEC /S/M/ /	QZIT /S/E/ /	VIPA /S/M/ /
CINPRD /S/M/ /	RAYLGH /S/M/ /	VIPD /S/M/ /
COMHES /S/E/ /	RLSUBM /S/I/ /	VIPDA /S/M/ /
CORTH /S/E/ /	RLSUM /S/I/ /	VIPDS /S/M/ /
DCBHT /S/M/ /	SCPF /S/D/*/	VIPRFF /S/I/ /
DCWNE /S/M/ /	SMTVX /S/M/ /	VIPRSS /S/I/ /
DCWNP /S/M/ /	SMVX /S/M/ /	VIPS /S/M/ /
DECOM /S/M/ /	SPDCOM /S/M/ /	VMULBB /S/I/ /
EBALAC /S/I/ /	SUBDIA /S/M/ /	VMULBF /S/I/ /
EBALAF /S/I/ /	SUBDIR /S/M/ /	VMULBS /S/I/ /
ELMHES /S/E/ /	SUMF /S/D/*/	VMULFB /S/I/ /
ELTRAN /S/E/ /	SVD /S/A/ /	VMULFF /S/I/ /
FABSV /S/M/ /	SVD /S/E/ /	VMULFM /S/I/ /
FACOMB /S/M/ /	TRED1 /S/E/ /	VMULFP /S/I/ /
FIGI /S/F/ /	TRED2 /S/E/ /	VMULFQ /S/I/ /
FIGI2 /S/E/ /	TRED3 /S/E/ /	VMULFS /S/I/ /
FIP /S/A/ /	TRI01 /S/M/ /	VMULQB /S/I/ /
FMMX /S/M/ /	TRI1 /S/A/ /	VMULQF /S/I/ /
FMTMX /S/M/ /	TRI2 /S/A/ /	VMULQQ /S/I/ /
FMTR /S/M/ /	TRI3 /S/A/ /	VMULQS /S/I/ /
FMTVCX /S/M/ /	TRI4 /S/A/ /	VMULSB /S/I/ /
FMTVX /S/M/ /	USCROM /S/I/ /	VMULSF /S/I/ /
FMVCX /S/M/ /	USMNMX /S/I/ /	VMULSQ /S/I/ /
FMVX /S/M/ /	USROM /S/I/ /	VMULSS /S/I/ /
FNORM1 /S/M/ /	USRDV /S/I/ /	VNRMFI /S/I/ /
FPUR /S/M/ /	USWB /S/I/ /	VNRMF1 /S/I/ /
HSSN /S/M/ /	USWBSM /S/I/ /	VNRMF2 /S/I/ /
HTRID1 /S/E/ /	USWLFM /S/I/ /	VNRMS1 /S/I/ /
HTRID3 /S/E/ /	USWLSM /S/I/ /	VNRMS2 /S/I/ /
INRPRD /S/M/ /	USWTFM /S/I/ /	VPOLYF /S/I/ /
INVS /S/D/*/	USWTFV /S/I/ /	VTPROF /S/I/ /
ITERIN /S/M/ /	USWTSM /S/I/ /	VTPROS /S/I/ /
LEQT1R /S/I/ /	USWTSV /S/I/ /	VTRAN /S/I/ /
LEQT1C /S/I/ /	VABMXF /S/I/ /	VUABQ /S/I/ /
LEQT2R /S/I/ /	VABMXS /S/I/ /	VUAFB /S/I/ /
LEQT2C /S/I/ /	VABSMF /S/I/ /	VUAFQ /S/I/ /
LEQ1S /S/I/ /	VABSMS /S/I/ /	VUAFS /S/I/ /
LEQ2S /S/I/ /	VCONVO /S/I/ /	VUASB /S/I/ /
LU1 /S/A/ /	VCVTBF /S/I/ /	VUASQ /S/I/ /
LU2 /S/A/ /	VCVTCH /S/I/ /	

F2 EIGENVALUES AND EIGENVECTORS

AEVS /S/D/*/	EIGRS /S/I/ /	RECOV1 /S/M/ /
BAC1 /S/A/ /	EIGSYM /S/M/ /	RECOV2 /S/M/ /
BAC2 /S/A/ /	EIGVCH /S/M/ /	REDSY1 /S/M/ /
BAKVEC /S/E/ /	EIGZC /S/I/ /	REDSY2 /S/M/ /
BALBAK /S/E/ /	EIGZF /S/I/ /	REDUC /S/E/ /
BANDV /S/E/ /	EIG5 /S/M/ /	REDUC1 /S/A/ /
BANEIG /S/M/ /	ELMBAK /S/E/ /	REDUC2 /S/E/ /
BISEC /S/A/ /	ELRH1C /S/I/ /	RG /S/E/ /
BISECT /S/E/ /	ELRH2C /S/I/ /	RGG /S/E/ /
BQR /S/E/ /	ELZHC /S/I/ /	RITZIT /S/A/ /
CRA8K2 /S/E/ /	ELZVC /S/I/ /	RNQL1 /S/A/ /
CG /S/E/ /	EQRH1F /S/I/ /	RS /S/E/ /
CH /S/E/ /	EQRH3F /S/I/ /	RSB /S/E/ /
CINVT /S/E/ /	EQRT1S /S/I/ /	RSG /S/E/ /
COMBAK /S/E/ /	EQRT2S /S/I/ /	RSGA8 /S/E/ /
COMLR /S/E/ /	EQRT3S /S/I/ /	RSGBA /S/E/ /
COMLR2 /S/E/ /	EQZQF /S/I/ /	RSP /S/E/ /
COMQR /S/E/ /	EQZTF /S/I/ /	RST /S/E/ /
COMQR2 /S/E/ /	EQZVF /S/I/ /	RT /S/E/ /
CORTB /S/E/ /	HQR /S/E/ /	SEPAR /S/M/ /
DEIG /S/M/ /	HQR2 /S/E/ /	SEPAR2 /S/M/ /
DTSHFT /S/M/ /	HTRIBK /S/E/ /	SEVS /S/D/*/
EBALAC /S/I/ /	HTRIB3 /S/E/ /	SIMP /S/M/ /
EBALAF /S/I/ /	IMQL1 /S/A/ /	SYMLR /S/M/ /
EB8CKC /S/I/ /	IMTQLV /S/E/ /	SYMQR /S/M/ /
EB8CKF /S/I/ /	IMTQL1 /S/E/ /	TGOIAG /S/M/ /
EB8CKF /S/I/ /	IMTQL2 /S/E/ /	TINVIT /S/E/ /
EB8CKH /S/I/ /	INIT /S/A/ /	TQLRAT /S/E/ /
EHESSC /S/I/ /	INVIT /S/E/ /	TQL1 /S/E/ /
EHESFF /S/I/ /	LATNTR /S/M/ /	TQL2 /S/E/ /
FHOBKS /S/I/ /	ORTBAK /S/E/ /	TRBAK1 /S/E/ /
EHOU5H /S/I/ /	QREIGN /S/M/ /	TRBAK3 /S/E/ /
EHOU5S /S/I/ /	QZABX /S/A/ /	TRIDIB /S/E/ /
EIGCC /S/I/ /	QZVAL /S/E/ /	TSTURN /S/E/ /
EIGCH /S/I/ /	QZVEC /S/E/ /	VALVEC /S/M/ /
EIGCHK /S/M/ /	RATQR /S/E/ /	VARAH1 /S/N/*/
EIGCO1 /S/M/ /	REBAK /S/E/ /	VARAH2 /S/N/*/
EIGIMP /S/M/ /	REBAKA /S/A/ /	VECTOR /S/M/ /
EIGRF /S/I/ /	REBAKB /S/E/ /	

F3 DETERMINANTS

BPD50M /S/M/ /	LINSYS /S/M/ /	MATINS /S/N/N/
DETERM /S/M/ /	LINV3F /S/I/ /	PDITRM /S/M/ /
GAUSS /S/N/N/	LINV3P /S/I/ /	PDITRS /S/M/ /
LESWNE /S/M/ /	LITWNE /S/M/ /	SPITRM /S/M/ /
LESWNP /S/M/ /	LITWNP /S/M/ /	SPITRS /S/M/ /

F4 SIMULTANEOUS LINEAR EQUATIONS

BFBANP /S/M/ /	LEQS2 /S/A/ /	LUELMP /S/I/ /
PFBSUM /S/M/ /	LEQS3 /S/A/ /	LUELPM /S/I/ /
BITERM /S/M/ /	LEQS4 /S/A/ /	LUREFF /S/I/ /
RITRFM /S/M/ /	LEQS5 /S/A/ /	LUREFP /S/I/ /
BITRNP /S/M/ /	LEQS6 /S/A/ /	LUREPB /S/I/ /
BITRPD /S/M/ /	LEQT1B /S/I/ /	MAM /S/N/*/
BITWNP /S/M/ /	LEQT1C /S/I/ /	MAM200 /S/N/*/
BLESOM /S/M/ /	LEQT1F /S/I/ /	MATINS /S/N/N/
BLSWNP /S/M/ /	LEQT1P /S/I/ /	OFIMA3 /S/I/ /
BMAM /S/N/*/	LEQT2B /S/I/ /	ORIMP /S/A/ /
BPDITH /S/M/ /	LEQT2C /S/I/ /	ORSOL /S/A/ /
BPOSFB /S/M/ /	LEQT2F /S/I/ /	PDITRM /S/M/ /
BPOSOM /S/M/ /	LEQT2P /S/I/ /	PDITRS /S/M/ /
BSUBHT /S/M/ /	LEQ1PB /S/I/ /	POLSOM /S/M/ /
CCONGR /S/M/ /	LEQ1S /S/I/ /	POLSOS /S/M/ /
CFBSUM /S/M/ /	LEQ2PB /S/I/ /	PDSFBM /S/M/ /
CGAUSS /S/N/N/	LEQ2S /S/I/ /	PDSFBS /S/M/ /
CGITRF /S/M/ /	LESWNE /S/M/ /	QR1 /S/M/ /
CGLESF /S/M/ /	LESWNP /S/M/ /	RQWNT /S/M/ /
CITERF /S/M/ /	LINSYS /S/M/ /	SCONG /S/M/ /
CMPINV /S/N/N/	LINV1F /S/I/ /	SPDFBM /S/M/ /
FBSUBM /S/M/ /	LINV1P /S/I/ /	SPDFBS /S/M/ /
FBSUBS /S/M/ /	LINV2F /S/I/ /	SPDSOM /S/M/ /
FCGM2 /S/M/ /	LINV2P /S/I/ /	SPDSOS /S/M/ /
GAUSS /S/N/N/	LINV3F /S/I/ /	SPITRM /S/M/ /
GITRFM /S/M/ /	LINV3P /S/I/ /	SPITRS /S/M/ /
GITRFS /S/M/ /	LIN1PB /S/I/ /	TRDCNP /S/M/ /
GLESOM /S/M/ /	LIN2PB /S/I/ /	TRDCOM /S/M/ /
GLESOS /S/M/ /	LITWNE /S/M/ /	TRDFBM /S/M/ /
IMPR1 /S/A/ /	LITWNP /S/M/ /	TRDSOM /S/M/ /
IMPR2 /S/A/ /	LLSQAR /S/I/ /	TROSUB /S/M/ /
INVERS /S/M/ /	LPSDOR /S/I/ /	TRDWNP /S/M/ /
INVITR /S/M/ /	LSQHTM /S/M/ /	TRILOM /S/M/ /
ITERFM /S/M/ /	LSQHTS /S/M/ /	TRILOS /S/M/ /
ITERFS /S/M/ /	LSQSIT /S/M/ /	TRIUPM /S/M/ /
ITRPDM /S/M/ /	LSVALR /S/I/ /	TRIUPS /S/M/ /
ITRPDS /S/M/ /	LUDAPB /S/I/ /	TRLOIN /S/M/ /
ITRSPM /S/M/ /	LUDATF /S/I/ /	TRUPIN /S/M/ /
ITRSPS /S/M/ /	LUDECP /S/I/ /	
LEQS1 /S/A/ /	LUELMF /S/I/ /	

G0 STATISTICAL ANALYSIS AND PROBABILITY

BMD01S /M/B/ /	BMD12S /M/B/ /	USLEAP /S/I/ /
BMD03S /M/B/ /	BMD13S /M/B/ /	USRDMV /S/I/ /
BMD09S /M/B/ /	BMD14S /M/B/ /	USTREE /S/I/ /
BMD10S /M/B/ /	EDIT /O/S/ /	ZRMN /S/M/ /
BMD11S /M/B/ /	OMNITAB/M/ /R/	

G1 DATA REDUCTION (COMMON STATISTICAL PARAMETERS)

AGGREGA /D/S/ /	BMDP4D /M/C/ /	FILTER /S/M/ /
AGLMOO /S/I/ /	BMDP5D /M/C/ /	FREQCY /S/D/*/
AMEANS /S/I/ /	BMDP6D /M/C/ /	FREQUEN /D/S/ /
AORDR /S/I/ /	BMDP7D /M/C/ /	GTMN /S/I/ /
BDCOU1 /S/I/ /	BMDP8D /M/C/ /	GTMN1 /S/I/ /
BDCOU2 /S/I/ /	BMDP9D /M/C/ /	OP1RAY /S/M/ /
BECORI /S/I/ /	BMD01D /M/B/ /	OP2RAY /S/M/ /
BECORO /S/I/ /	BMD04D /M/B/ /	SSPAND /S/I/ /
BECOVH /S/I/ /	BMD05D /M/B/ /	SSPBLK /S/I/ /
BECVLI /S/I/ /	BMD06D /M/B/ /	SSRAND /S/I/ /
BECVLO /S/I/ /	BMD07D /M/B/ /	SSRBLK /S/I/ /
BEGRPS /S/I/ /	BMD10D /M/B/ /	SSSAND /S/I/ /
BEIGRP /S/I/ /	BMD11D /M/B/ /	SSSBLK /S/I/ /
BEIUGR /S/I/ /	BMD13D /M/B/ /	SSSCAN /S/I/ /
BELBIN /S/I/ /	BPEAKD /D/S/ /	SSSEST /S/I/ /
BELPOS /S/I/ /	CONDESC /D/S/ /	STUTEE /S/M/*/
BEMIRI /S/I/ /	CONTAB /S/D/*/	T-TEST /D/S/ /
BEMIRO /S/I/ /	CORREL /S/D/*/	TTESTS /S/D/*/
BEMMI /S/I/ /	CORS /S/D/*/	USHIST /S/I/ /
BEMMO /S/I/ /	DISTAT /S/D/*/	USHIUT /S/I/ /
BMDP1D /M/C/ /	DELETE /S/M/ /	USHV1 /S/I/ /
BMDP2D /M/C/ /	DSCRPT /S/M/ /	
BMDP3D /M/C/ /	DSCRPP2 /S/M/ /	

G2 CORRELATION AND REGRESSION ANALYSIS

BECTR /S/I/ /	CORREL /S/D/*/	RLFITO /S/I/ /
BEMIRI /S/I/ /	CORS /S/D/*/	RLFOR /S/I/ /
BEMIRO /S/I/ /	CTBNLL /S/I/ /	RLFORC /S/I/ /
BESR3 /S/I/ /	DSCRIM /S/D/*/	RLFOTH /S/I/ /
BESRN /S/I/ /	G3SLS /D/S/ /	RLFOTW /S/I/ /
BMDP1R /M/C/ /	LAGCOR /S/D/*/	RLGQMI /S/I/ /
BMDP2R /M/C/ /	LSQHTM /S/M/ /	RLGQMO /S/I/ /
BMDP3R /M/C/ /	LSQHTS /S/M/ /	RLINCF /S/I/ /
BMDP4R /M/C/ /	LSQSIT /S/M/ /	RLINPF /S/I/ /
BMDP5R /M/C/ /	MORS /S/D/*/	RLMUL /S/I/ /
BMDP6R /M/C/ /	NONLINE /D/S/ /	RLONE /S/I/ /
BMD01R /M/B/ /	NONPAR /D/S/ /	RLOPOC /S/I/ /
BMD02D /M/B/ /	OFRESI /S/I/ /	RLPOLY /S/I/ /
BMD02R /M/B/ /	PARTIAL /D/S/ /	RLPOL1 /S/I/ /
BMD03D /M/B/ /	PEARSON /D/S/ /	RLPRDI /S/I/ /
BMD03R /M/B/ /	PLOT /D/S/ /	RLPRDO /S/I/ /
BMD04R /M/B/ /	REGRAN /S/D/*/	RLRES /S/I/ /
BMD05R /M/B/ /	REGRESS /D/S/ /	RLSEP /S/I/ /
BMD06R /M/B/ /	RLCOMP /S/I/ /	RLSTEP /S/I/ /
BMD07R /M/B/ /	RLOCQM /S/I/ /	RSMITZ /S/I/ /
BMD09M /M/B/ /	RLDCVA /S/I/ /	RSMSSE /S/I/ /
BMD12D /M/B/ /	RLOCW /S/I/ /	SCATTER /D/S/ /
CANONA /S/D/*/	RLOPM /S/I/ /	TORS /S/D/*/
CNRHO /S/I/ /	RLEAP /S/I/ /	TETRACH /D/S/ /
CORCOV /S/M/ /	RLFITI /S/I/ /	

G4 ANALYSIS OF VARIANCE

ABALAT /S/I/ /	ANESTU /S/I/ /	BMD02V /M/B/ /
ABIBAN /S/I/ /	ANOVA /D/S/ /	BMD03V /M/B/ /
ACROAN /S/I/ /	ANOVAR /S/D/*/	BMD04V /M/B/ /
ACTRST /S/I/ /	ANOVA1 /S/N/*/	BMD05V /M/B/ /
AFACAN /S/I/ /	ANOVA2 /S/N/*/	BMD06V /M/B/ /
AFACMN /S/I/ /	AORDR /S/I/ /	BMD07V /M/B/ /
AFACT /S/I/ /	ARCBAN /S/I/ /	BMD08V /M/B/ /
AGBACP /S/I/ /	ASNKMC /S/I/ /	BMD09V /M/B/ /
AGLMOD /S/I/ /	AVAR23 /S/D/*/	BMD10V /M/B/ /
AGVACL /S/I/ /	AVTRND /S/D/*/	BMD11V /M/B/ /
AGXPMN /S/I/ /	BETWEEN/S/D/*/	BMD12V /M/B/ /
AGXPMS /S/I/ /	BETWITH/S/D/*/	BRTLTT /S/M/ /
ALSQAN /S/I/ /	BMDP1V /M/C/ /	DISTAT /S/D/*/
AMEANS /S/I/ /	BMDP2V /M/C/ /	MANOVA /D/S/ /
ANCOV1 /S/I/ /	BMDP7D /M/C/ /	ONEWAY /D/S/ /
ANESTE /S/I/ /	BMD01V /M/B/ /	WITHIN /S/D/*/

G5 TIME SERIES

BMD01T /M/B/ /	FTARPS /S/I/ /	FTKALM /S/I/ /
BMD02T /M/B/ /	FTAUTO /S/I/ /	FTMAPS /S/I/ /
BMD03T /M/B/ /	FTCAST /S/I/ /	FTMAXL /S/I/ /
BMD04T /M/B/ /	FTCOMP /S/I/ /	FTRDIF /S/I/ /
BMD05T /M/B/ /	FTCROS /S/I/ /	FTSIMP /S/I/ /
FFCSIN /S/I/ /	FTCRXY /S/I/ /	FTTRAN /S/I/ /
FFTP /S/I/ /	FTFFT1 /S/I/ /	FTWEIN /S/I/ /
FFTR /S/I/ /	FTFREQ /S/I/ /	FTWENM /S/I/ /
FFT2 /S/I/ /	FTFUNC /S/I/ /	FTWENX /S/I/ /
FFT2RV /S/I/ /	FTGEN1 /S/I/ /	HARM /S/M/ /

G6 SPECIAL FUNCTIONS (INCLUDES RANDOM NUMBERS AND PDF'S)

BETAR /S/M/ /	GTPKP /S/I/ /	PFDIST /S/M/ /
BMDP1S /M/C/ /	GTPL /S/I/ /	PGEOM /S/M/ /
CHICHI /S/D/*/	GTPOK /S/I/ /	PGHMA /S/M/ /
CHIDST /S/M/ /	GTPRT /S/I/ /	PHYPGE /S/M/ /
CHIPRB /S/M/ /	GTPST /S/I/ /	PIBETA /S/M/ /
CHIPAB /S/M/ /	GTRN /S/I/ /	PIBIN /S/M/ /
CHIRUD /S/M/ /	GTRT /S/I/ /	PICHI /S/M/ /
CHSQO /S/M/ /	GTRTM /S/I/ /	PICHY /S/M/ /
CONRAY /S/M/ /	GTSRT /S/I/ /	PIEXP /S/M/ /
EXRAND /S/M/ /	GTTRT /S/I/ /	PIFOIS /S/M/ /
GFTT /S/I/ /	GTTT /S/I/ /	PIGAMA /S/M/ /
GGAMA /S/I/ /	IAOC /S/N/*/	PIGEO /S/M/ /
GGBIN /S/I/ /	IDAYWEK/S/N/*/	PIHYPG /S/M/ /
GGBNB /S/I/ /	IRAND /S/M/ /	PILGNM /S/M/ /
GGRTA /S/I/ /	MOBETA /S/I/ /	PINBIN /S/M/ /
GGCAU /S/I/ /	MOBETI /S/I/ /	PINORM /S/M/ /
GGCSS /S/I/ /	MOBIN /S/I/ /	PIPOIS /S/M/ /
GGEOM /S/I/ /	MOBONR /S/I/ /	PIRAYL /S/M/ /
GGEXP /S/I/ /	MOCH /S/I/ /	PIS /S/M/ /
GGHYP /S/I/ /	MOCHI /S/I/ /	PIT /S/M/ /
GGMUL /S/I/ /	MOFD /S/I/ /	PITRNM /S/M/ /
GGNLN /S/I/ /	MOFDRE /S/I/ /	PIUNF /S/M/ /
GGNMP /S/I/ /	MDFI /S/I/ /	PIUNFD /S/M/ /

G6 SPECIAL FUNCTIONS (CONTINUED)

GGNOF /S/I/ /	MDGAM /S/I/ /	PIWEBL /S/M/ /
GGNOR /S/I/ /	MDHYP /S/I/ /	PLGNRM /S/M/ /
GGNRM /S/I/ /	MDNOR /S/I/ /	PNBIN /S/M/ /
GGNRM1 /S/I/ /	MDPOS /S/I/ /	PNORM /S/M/ /
GGPOSH /S/I/ /	MDSMR /S/I/ /	PORAND /S/M/ /
GGPOSR /S/I/ /	MDSTI /S/I/ /	PRAYL /S/M/ /
GGSPR /S/I/ /	MDTD /S/I/ /	PRBEXP /S/M/ /
GGTMAJ /S/I/ /	MDTN /S/I/ /	PRBF /S/O/*/
GGTMA1 /S/I/ /	MOTNF /S/I/ /	PRBUNF /S/M/ /
GGTMA2 /S/I/ /	MOTPOS /S/I/ /	PTDIST /S/M/ /
GGTRI /S/I/ /	MNDRIS /S/I/ /	PTRNRM /S/M/ /
GGUB /S/I/ /	MSMRAT /S/I/ /	PUNFD /S/M/ /
GGUBF /S/I/ /	NOMPLE /S/I/ /	PWEBL /S/M/ /
GGU4 /S/I/ /	NDXEST /S/I/ /	RAND /S/M/ /
GGVACR /S/I/ /	NONPAR /D/S/ /	RANNUM /S/N/*/
GGWEI /S/I/ /	NRAND /S/M/ /	RUNSAB /S/M/ /
GTDD /S/I/ /	NRML /S/M/ /	RUNSUD /S/M/ /
GTDD1 /S/I/ /	NRMO /S/M/ /	URAND /S/M/ /
GTDT /S/I/ /	PBETA /S/M/ /	USPC /S/I/ /
GTNOR /S/I/ /	PBINOM /S/M/ /	USPDF /S/I/ /
GTPBC /S/I/ /	PCHY /S/M/ /	XIRAND /S/M/ /

G7 MULTIVARIATE ANALYSIS AND SCALE STATISTICS

AFACT /S/I/ /	BMD07M /M/B/ /	OFHARR /S/I/ /
BMDP1M /M/C/ /	BMD07S /M/B/ /	OFIMAG /S/I/ /
BMDP2M /M/C/ /	BMD08M /M/B/ /	OFPRIN /S/I/ /
BMDP3M /M/C/ /	BMD08S /M/B/ /	OFPROT /S/I/ /
BMDP4M /M/C/ /	BMD09M /M/B/ /	OFROTA /S/I/ /
BMDP6M /M/C/ /	BMD10M /M/B/ /	OFSCHN /S/I/ /
BMDP7M /M/C/ /	CANCORR /D/S/ /	OFSCOR /S/I/ /
BMD01M /M/B/ /	DISCRIM /D/S/ /	OPRINC /S/I/ /
BMD02M /M/B/ /	FACTOR /D/S/ /	OTMLNR /S/I/ /
BMD03M /M/B/ /	FACTOR /S/D/*/	RELATE /S/D/*/
BMD04M /M/B/ /	GUTTMAN /D/S/ /	RELIABI /D/S/ /
BMD04S /M/B/ /	HGROUP /S/D/*/	TESTAT /S/D/*/
BMD05M /M/B/ /	JFACTOR /D/S/ /	TSCALE /S/D/*/
BMD05S /M/B/ /	OCLINK /S/I/ /	VORS /S/D/*/
BMD06M /M/B/ /	OFCEOF /S/I/ /	
BMD06S /M/B/ /	OFCOMM /S/I/ /	

G8 NON-PARAMETRIC METHODS AND STATISTICAL TESTS

BMDP1F /M/C/ /	NBQT /S/I/ /	NMRANK /S/I/ /
BMDP3S /M/C/ /	NBSO /S/I/ /	NMTIE /S/I/ /
BMD02S /M/B/ /	NBSIGN /S/I/ /	NONPAR /D/S/ /
BMD08D /M/B/ /	NBSL /S/I/ /	NPAR /D/S/ /
BMD09D /M/B/ /	NOMPLE /S/I/ /	NRBHA /S/I/ /
CROSSTA /D/S/ /	NHEXT /S/I/ /	NRWMP /S/I/ /
NAK1 /S/I/ /	NHINC /S/I/ /	NRWRST /S/I/ /
NAWNRP /S/I/ /	NMCC /S/I/ /	NSK1 /S/I/ /
NAWRPE /S/I/ /	NMKEN /S/I/ /	NSK2 /S/I/ /
NAWRPU /S/I/ /	NMKSF /S/I/ /	SUMMARY /D/S/ /
NBCYC /S/I/ /	NMKST /S/I/ /	

G9	STATISTICAL INFERENCE		
	AGVACL /S/I/ /	BEPATN /S/I/ /	CTRBYC /S/I/ /
	ASNKMC /S/I/ /	BEPATS /S/I/ /	GTCN /S/I/ /
	BFMNON /S/I/ /	BEPETN /S/I/ /	OIND /S/I/ /
	BFMSON /S/I/ /	BEPETS /S/I/ /	
	BENSON /S/I/ /	CONTAB /S/D/*/	
H1	LINEAR PROGRAMMING		
	ZX1LP /S/I/ /	ZX2LP /S/I/ /	ZX3LP /S/I/ /
H3	TRANSPORTATION AND NETWORK CODES		
	PERTC /M/ /R/	PERTIME/M/ /R/	
H4	SIMULATION MODELING		
	GPSS /M/ /R/	SIMIIS /M/ /R/	
	MI4IC /M/ /R/	SIMI5 /M/ /R/	
I0	INPUT		
	FASTIN /S/N/*/		
I2	OCTAL		
	OFMTDE /S/N/N/	OFMTV /S/N/N/	
I3	DECIMAL		
	CRDTAB /S/N/*/	USRDM /S/I/ /	USRDMV /S/I/ /
	USCRDM /S/I/ /	USRDV /S/I/ /	
I4	BCD (HOLLERITH)		
	ICOM /S/N/*/	ICOMN /S/N/*/	IFMTV /S/N/N/
I9	COMPOSITE		
	RECOVRD/S/N/N/	START /S/M/ /	
J0	OUTPUT		
	MPSCM /M/U/U/		
J1	BINARY		
	CV29 /M/U/U/	CV29 /P/P/P/	
J2	OCTAL		
	PRTFL /S/N/N/		
J3	DECIMAL		
	PCDS /S/D/*/	USRDMV /S/I/ /	USWTFM /S/I/ /
	PRTS /S/D/*/	USWB /S/I/ /	USWTFV /S/I/ /
	PTMS /S/D/*/	USWBSM /S/I/ /	USWTSN /S/I/ /
	SUBS /S/D/*/	USWLFM /S/I/ /	USWTSV /S/I/ /
	USLFAP /S/I/ /	USWLSM /S/I/ /	
J4	BCD (HOLLERITH)		
	BANR /S/N/N/	LINE6 /P/P/P/	PM /P/P/P/
	COPYSE /M/ /R/	LINE6 /S/N/N/	PRTIME /S/N/N/
	ICOM /S/N/*/	LINE8 /P/P/P/	
	ICOMN /S/N/*/	LINE8 /S/N/N/	

J5	PLOTTING		
	BMDP5D /M/C/ /	PLOTMY /S/N/*/	USHIUT /S/I/ /
	BMDP6D /M/C/ /	PLOTPR /S/N/N/	USHV1 /S/I/ /
	BMDP7D /M/C/ /	PLOTXY /S/N/*/	USPC /S/I/ /
	BMD05D /M/B/ /	SCATTER/D/S/ /	USPDF /S/I/ /
	CALCOMP/S/ /R/	SCCALC /S/ /R/	USPLH /S/I/ /
	CALC3D /P/P/P/	SC4020 /S/ /R/	USPLX /S/I/ /
	DISSPLA/S/ /R/	SC4060 /S/ /R/	USTREE /S/I/ /
	HSTGRM /S/M/ /	TEKTRN/S/ /R/	XPLOT /S/M/ /
	PLOT /D/S/ /	USHIST /S/I/ /	XYPLOT /S/M/ /
J9	COMPOSITE		
	HEXDMP /M/U/U/	PRUDMP /M/U/U/	TAPDMP /M/U/U/
K1	EXTERNAL-TO-EXTERNAL		
	COPYE /M/ /R/	COPYS /M/ /R/	PROMNT /M/U/U/
	COPYF /M/ /R/	COPYS /P/P/P/	RECAOD /P/P/P/
	COPYR /M/ /R/	COPYSEL/M/U/U/	RECODELE/P/P/P/
	COPYRE /M/U/U/	COPYSF /M/ /R/	RECGET /P/P/P/
	COPYRM /M/ /R/	CVT360 /M/ /R/	REGREPL/P/P/P/
K2	INTERNAL-TO-INTERNAL (RELOCATION)		
	GETPA /S/N/*/	MSET /S/N/N/	
	MFETCH /S/N/N/	RCPA /S/N/N/	
K3	DISK		
	COPYL /M/ /R/	GETOBJ /M/U/U/	UPDGET /P/P/P/
	COPYLIB/M/U/U/	PRUDMP /M/U/U/	UPDGETS/P/P/P/
	COPYLIB/P/P/P/	SELDUMP/P/P/P/	UPDGETT/P/P/P/
	COPYN /M/ /P/	TRANPAK/P/P/P/	UPDREPL/P/P/P/
	CPINDEX/P/P/P/	UPDADD /P/P/P/	
	DOCUMENT/M/U/U/	UPODELE/P/P/P/	
K4	TAPE		
	COPYBFR/M/ /R/	HEXDMP /M/U/U/	TAPDMP /M/U/U/
	COPYBLK/P/P/P/	SELLOAD/P/P/P/	
L2	COMPILING		
	ALGOL /M/ /P/	PASCAL /M/ /R/	RUNMNF /P/P/P/
	BASIC /M/ /R/	PL1 /M/ /R/	RUNSEQ /P/P/P/
	COBOL /M/ /R/	RUN /M/ /R/	RUNTS /P/P/P/
	FTN /M/ /R/	RUNBAS /P/P/P/	SNOBOL /M/ /R/
	MNF /M/ /*/	RUNFTN /P/P/P/	
L3	MONITORING		
	COMPASS/M/ /R/	COMRADE/M/ /R/	
L4	PREPROCESSING		
	RATFOR /M/ /*/	TIDY /M/ /R/	
L7	COMPUTER LANGUAGE TRANSLATORS		
	LCS /M/ /R/		
M0	DATA HANDLING		
	COMPSTR/S/N/*/	EQU60 /S/N/N/	MASKIT /S/N/N/

M1	SORTING		
	ASORT /S/N/N/	QSORT /S/N/N/	VARORD /S/M/ /
	ASORTMV/S/N/N/	QSORT1 /S/N/N/	VECORD /S/M/ /
	AUDIT /P/P/P/	SORTMRG/M/ /R/	VSORTA /S/I/ /
	AUDSORT/M/U/U/	SSORT /S/N/N/	VSORTM /S/I/ /
	BMD14S /M/B/ /	SSORTE /S/N/N/	VSORTP /S/I/ /
	DEKSORT/M/U/U/	SSORTI /S/N/N/	VSORTZ /S/I/ /
	HSTGRM /S/M/ /	SSORTL /S/N/N/	VSRTPM /S/I/ /
M2	CONVERSION AND/OR SCALING		
	BMD09S /M/B/ /	GETHOUR/S/N/N/	MONTH /S/N/N/
	BMD12S /M/B/ /	IHMS /S/N/N/	NEWDAT /S/N/N/
	BMD13S /M/B/ /	IROMAN /S/N/N/	TIDY /M/ /R/
	CVT360 /M/ /R/	ISEC /S/N/N/	WEKDAY /S/N/N/
	CV29 /M/U/U/	JGDATE /S/N/N/	
	CV29 /P/P/P/	JULIAN /S/N/N/	
M3	MERGING		
	SORTMRG/M/ /R/		
M4	CHARACTER MANIPULATION		
	ADJL /S/N/N/	GETPRM /S/N/*/	SBYT /S/N/N/
	ADJR /S/N/N/	IBUNP /S/N/*/	SEMICO /S/N/N/
	ASHIFT /S/N/N/	IPAKLFT/S/N/N/	SENT /S/N/*/
	CENTER /S/N/N/	ISTAPE /S/N/N/	SETREW /S/N/N/
	CHFILL /S/N/N/	LBYT /S/N/N/	SHIFTA /S/N/N/
	CONTRACT/S/N/*/	LEFTADJ/S/N/N/	SKWEZL /S/N/N/
	COPYEXT/M/U/U/	MOVSTR /S/N/N/	SKWEZR /S/N/N/
	EXPAND /S/N/*/	PARGET /S/N/N/	TRAILBZ/S/N/N/
	EXPRM /S/N/*/	PUTCHA /S/N/N/	VALDAT /S/N/N/
	EXTBIT /S/N/N/	PUTCHR /S/N/N/	VFILL /S/N/N/
	EXTPRM /S/N/N/	REPLAC /S/N/N/	ZBLANK /S/N/N/
	FBINRD /S/N/*/	REPLACM/S/N/N/	ZEROES /S/N/*/
	FORMATR/M/U/U/	REPLHI /S/N/N/	ZEROFL /S/N/N/
	GETCHA /S/N/N/	REPLLO /S/N/N/	ZEROS /S/N/N/
	GETCHR /S/N/N/	REPLNE /S/N/N/	
M5	SEARCHING, SEEKING, LOCATING		
	AMAXE /S/N/N/	GETCHR /S/N/N/	MINE /S/N/N/
	AMINE /S/N/N/	IDIGIT /S/N/N/	NFILLT /S/N/N/
	FINDC /S/N/N/	IFINDCH/S/N/N/	NUMVAR /S/N/*/
	FINDW /S/N/N/	LASTC /S/N/N/	VALIDT /S/N/N/
	FINDWRD/S/N/N/	LASTWRD/S/N/N/	
	GETCHA /S/N/N/	MAXE /S/N/N/	
M6	REPORT GENERATORS		
	QU /M/ /R/	SCORE /M/ /R/	
N0	DEBUGGING		
	ALTIME /S/N/N/	MONERR /S/F/ /	
	ELTIME /S/N/N/	PRTIME /S/N/N/	
N1	TPACING AND TRAPPING		
	ING /S/D/*/		

N2	DUMPING		
	DMPA /S/N/N/	DMPFIT /S/N/N/	DUMPFIT/S/N/N/
	DMPCPA /S/N/N/	DUMPA /S/N/N/	DUMPFL /S/N/N/
	DMPFIL /M/U/U/	DUMPCPA/S/N/N/	RECOVRD/S/N/N/
01	OFF-LINE EQUIPMENT		
	CARDS /M/U/U/	CV29 /M/U/U/	LIST3 /M/U/U/
	CARDS2 /M/U/U/	CV29 /P/P/P/	LIST4 /M/U/U/
	CCIRM /P/P/P/	DOCD0C /P/P/P/	PAGEPRT/M/U/U/
	CCLIR /P/P/P/	LINERL /M/U/U/	PRODOC /P/P/P/
	CCRM /M/U/U/	LISTCMP/M/U/U/	RECD0C /P/P/P/
	CCRM /P/P/P/	LISTEOI/M/U/U/	TIDBITS/P/P/P/
	COPYEXT/M/U/U/	LISTZ /M/U/U/	UPD00C /P/P/P/
	COPYRE /M/U/U/	LIST1 /M/U/U/	
	GOPYSEL/M/U/U/	LIST2 /M/U/U/	
P0	DIAGNOSTICS (HARDWARE MALFUNCTION)		
	UERTST /S/I/ /		
Q0	SERVICE OR HOUSEKEEPING, PROGRAMMING AIDS		
	AC /S/N/N/	IDIO /S/N/N/	PRTFL /S/N/N/
	ALTIME /S/N/N/	ISITCNF/S/N/N/	PTIM /M/U/U/
	AUDSORT/M/U/U/	JOBNAME/S/N/N/	REDUCE /S/N/N/
	BANNER /M/U/U/	JOBORG /S/N/N/	SEND /P/P/P/
	BANNER3/M/U/U/	JOBTIME/M/U/U/	SKPSTAT/S/N/N/
	BOT /P/P/P/	LINER /M/U/U/	WHATLIB/M/U/U/
	BFOATIM/M/U/U/	LINERL /M/U/U/	WHATLIB/P/P/P/
	ELTIME /S/N/N/	MACHINE/S/N/N/	WHICHMF/M/U/U/
	FTNREL /S/N/N/	MFH /P/P/P/	WHICHOS/M/U/U/
	GETFIT /S/N/N/	NORERUN/P/P/P/	ZPFPUT /S/N/N/
	GETLFNS/S/N/N/	NUMEXEC/S/N/N/	ZRTPUT /S/N/N/
	GODROP /S/N/*/	OVLNAME/S/N/N/	
	HERE /S/N/N/	PERC /S/N/N/	
Q3	FILE MANIPULATION		
	REQUEST/S/N/N/	S2K260 /P/P/P/	ZPFUNC /S/N/N/
	ROUTE /S/N/N/	S2000 /P/P/P/	ZSYSEQ /S/N/N/
	SKPFIL /S/N/N/	UNLOAD /S/N/N/	
Q4	INTERNAL HOUSEKEEPING, SAVE, RESTORE, ETC.		
	DBUTIL /M/ /R/	PRTIME /S/N/N/	SELDUMP/P/P/P/
	NUMVAR /S/N/*/	RENAMAC/P/P/P/	SELLOAD/P/P/P/
Q6	PROGRAM DOCUMENTATION: FLOW CHARTS, DOCUMENT, STANDARDIZATION		
	DOC /M/U/U/	DOCREPL/P/P/P/	PGMTAPE/P/P/P/
	DOCADD /P/P/P/	DOCTAPE/P/P/P/	PROGDOC/M/U/U/
	DOCDLEF/P/P/P/	DOCUMNT/M/U/U/	PURPOSE/M/U/U/
	DOCFILE/P/P/P/	EXECARD/M/U/U/	STRUCT /P/P/P/
	DOCGET /P/P/P/	MANYDOC/M/U/U/	TAPLIST/M/U/U/
	DOCIT /M/U/U/	MT00C /M/U/U/	UNDOCIT/M/U/U/
	DOCLIST/P/P/P/	PFD0C /M/U/U/	

07 PROGRAM LIBRARY UTILITIES

ANYLIB /P/P/P/	LISTBIN/M/U/U/	PROREPL/P/P/P/
ANYPRO /P/P/P/	LISTCMP/M/U/U/	REDECK /M/U/U/
BINDEX /M/U/U/	MNSRDC /P/P/P/	SORTUP /M/U/U/
COPYL /M/ /R/	MYPRO /P/P/P/	UPDADD /P/P/P/
COPYLIB/P/P/P/	NOGO /P/P/P/	UPDATE /M/ /R/
COPYN /M/ /R/	PPOADD /P/P/P/	UPDDELE/P/P/P/
CPINDEX/P/P/P/	PROALL /P/P/P/	UPDGET /P/P/P/
DECK /M/U/U/	PRODELE/P/P/P/	UPDGETS/P/P/P/
DEKLIST/M/U/U/	PROGET /P/P/P/	UPDGETT/P/P/P/
DEKSORT/M/U/U/	PROGRAM/P/P/P/	UPOLIST/P/P/P/
EDITLIB/M/ /R/	PROHDR /P/P/P/	UPDREPL/P/P/P/
ITEMIZE/M/ /R/	PROLIST/P/P/P/	UTILITY/P/P/P/
LIBSET1/P/P/P/	PROMNT /M/U/U/	
LIBSET2/P/P/P/	PRONAM /P/P/P/	

R1 FORMAL LOGIC

COUPLE /S/N/*/	XOR /S/N/*/
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R3 LIST AND STRING PROCESSING

SNOBOL /M/ /R/

R4 TEXT EDITING

EDITOR /M/ /R/	NETED /M/ /*/
FORMATR/M/U/U/	RNF /M/ /*/

S0 INFORMATION RETRIEVAL

AUDIT /P/P/P/	GRIPE /P/P/P/	RIQS /M/ /R/
COMRADE/M/ /R/	MARS /M/ /R/	SHARP /M/ /R/
DBUTIL /M/ /R/	PAGEPRT/M/U/U/	S2000 /M/ /R/
DDL /M/ /R/	PURPOSE/M/U/U/	TAPLIST/M/U/U/
DMS170 /M/ /R/	QQ /M/ /R/	VENUS /M/ /R/
EXECARD/M/U/U/	QU /M/ /R/	VENUS /P/P/P/

T4 ENGINEERING

AROCFT /S/N/*/	ECAP /M/ /R/	STRESS /M/ /R/
CIVCO /M/ /R/	NASTRAN/M/ /R/	

T6 MANUFACTURING (NON-DATA) PROCESSING AND PROCESS CONTROL

APT /M/ /P/

V1 RANDOM NUMBER GENERATORS

EXRAND /S/M/ /	NRMNO /S/M/ /	URAND /S/M/ /
IRAND /S/M/ /	PORAND /S/M/ /	XIRAND /S/M/ /
NRAND /S/M/ /	RAND /S/M/ /	
NRML /S/M/ /	RANNUM /S/N/*/	

V2 COMBINATORIAL GENERATORS: PERMUTATIONS, COMBINATIONS & SUBSETS

FFDR2 /S/I/ /

Z0 ALL OTHERS

SSP /S/ /R/

***** PROGRAMS *****

THE COMPUTER CENTER CURRENTLY MAINTAINS FOUR LIBRARIES OF MAIN PROGRAMS IN ABSOLUTE FORM:

- 1) BIMED - SOME OF THE BMD BIOMEDICAL STATISTICAL PROGRAMS
- 2) BIMEDP - SOME OF THE BMDP BIOMEDICAL STATISTICAL PROGRAMS
- 3) MNSRDC - LOCALLY WRITTEN AND/OR SUPPORTED SCIENTIFIC PROGRAMS
- 4) UTILITY - LOCALLY WRITTEN AND/OR SUPPORTED UTILITIES

THERE ARE ALSO SOME MAIN PROGRAMS, INCLUDING SPSS AND CVT360, WHICH ARE MAINTAINED IN SEPARATE FILES.

*** BIMED ***

THE FOLLOWING IS A LIST OF THE UCLA BIOMEDICAL STATISTICAL PROGRAMS. THOSE WITH AN ASTERISK (*) ARE AVAILABLE IN LIBRARY 'BIMED'. SOME OF THE OTHERS MAY BE ADDED IF REQUESTED.

REFERENCE: BMD BIOMEDICAL COMPUTER PROGRAMS, W. J. DIXON, EDITOR, UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, 1973.

BMD010	SIMPLE DATA DESCRIPTION
BMD020	CORRELATION WITH TRANSGENERATION
BMD030 *	CORRELATION WITH ITEM DELETION
BMD040	ALPHANUMERIC FREQUENCY COUNT
BMD050 *	GENERAL PLOT INCLUDING HISTOGRAM
BMD060	DESCRIPTION OF STRATA
BMD070	DESCRIPTION OF STRATA WITH HISTOGRAMS
BMD080	CROSS-TABULATION WITH VARIABLE STACKING
BMD090	CROSS-TABULATION, INCOMPLETE DATA
BMD100	DATA PATTERNS FOR DICHOTOMIES
BMD110	DATA PATTERNS FOR POLYCHOTOMIES
BMD120	ASYMMETRIC CORRELATION WITH MISSING DATA
BMD130	T PROGRAM

BMD01M	PRINCIPAL COMPONENT ANALYSIS
BMD02M	REGRESSION ON PRINCIPAL COMPONENTS
BMD03M	FACTOR ANALYSIS
BMD04M	DISCRIMINANT ANALYSIS FOR TWO GROUPS
BMD05M *	DISCRIMINANT ANALYSIS FOR SEVERAL GROUPS
BMD06M	CANONICAL ANALYSIS
BMD07M	STEPWISE DISCRIMINANT ANALYSIS
BMD08M	FACTOR ANALYSIS
BMD09M	CANONICAL CORRELATION ANALYSIS
BMD10M	IDENTIFICATION OF OUTLIERS

BMD01R SIMPLE LINEAR REGRESSION
BMD02R STEPWISE REGRESSION
BMD03R * MULTIPLE REGRESSION WITH CASE COMBINATIONS
BMD04R * PERIODIC REGRESSION AND HARMONIC ANALYSIS
BMD05R * POLYNOMIAL REGRESSION
BMD06R ASYMPTOTIC REGRESSION
BMD07R * NON-LINEAR LEAST SQUARES

BMD01S LIFE TABLE AND SURVIVAL RATE
BMD02S CONTINGENCY TABLE ANALYSIS
BMD03S BIOLOGICAL ASSAY: PROBIT ANALYSIS
BMD04S GUTTMAN SCALE PREPROCESSOR
BMD05S GUTTMAN SCALE # 1
BMD06S GUTTMAN SCALE # 2, PART 1
BMD07S GUTTMAN SCALE # 2, PART 2
BMD08S GUTTMAN SCALE # 2, PART 3
BMD09S TRANSGENERATION
BMD10S TRANSPOSITION OF LARGE MATRICES
BMD11S LIFE TABLE AND SURVIVAL RATE (NO. 2)
BMD12S OPEN-ENDED TRANSGENERATION
BMD13S MULTIPASS TRANSGENERATION
BMD14S GENERALIZED SORTING ROUTINE

BMD01T AMPLITUDE AND PHASE ANALYSIS
BMD02T AUTOCOVARANCE AND POWER SPECTRAL ANALYSIS
BMD03T TIME SERIES SPECTRUM ESTIMATION
BMD04T MULTIPLE TIME SERIES SPECTRAL ANALYSIS
BMD05T TIME-LOCKED AVERAGING

BMD01V ANALYSIS OF VARIANCE FOR ONE-WAY DESIGN
BMD02V ANALYSIS OF VARIANCE FOR FACTORIAL DESIGN
BMD03V ANALYSIS OF COVARIANCE FOR FACTORIAL DESIGN
BMD04V ANALYSIS OF COVARIANCE WITH MULTIPLE COVARIATES
BMD05V GENERAL LINEAR HYPOTHESIS
BMD06V GENERAL LINEAR HYPOTHESIS WITH CONTRASTS
BMD07V MULTIPLE RANGE TESTS
BMD08V ANALYSIS OF VARIANCE
BMD09V ANALYSIS OF COVARIANCE
BMD10V GENERAL LINEAR HYPOTHESIS (NO. 2)
BMD11V MULTIVARIATE GENERAL LINEAR HYPOTHESIS
BMD12V * MULTIVARIATE ANALYSIS OF VARIANCE AND COVARIANCE

*** BIMEOP ***

THE FOLLOWING IS A LIST OF THE UCLA BIOMEDICAL STATISTICAL PROGRAMS (P-SERIES). THOSE WITH AN ASTERISK (*) ARE AVAILABLE IN LIBRARY 'BIMEOP'. SOME OF THE OTHERS MAY BE ADDED IF REQUESTED.

REFERENCE: BMDP BIOMEDICAL COMPUTER PROGRAMS, W. J. DIXON, EDITOR, UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, 1975.

BMDP10	SIMPLE DATA DESCRIPTION
BMDP20	FREQUENCY COUNT ROUTINE
BMDP30	T TEST AND T-SQUARED ROUTINE
BMDP40	ALPHANUMERIC FREQUENCY COUNT ROUTINE
BMDP50	UNIVARIATE PLOTTING
BMDP60	BIVARIATE PLOTTING
BMDP70	DESCRIPTION OF STRATA WITH HISTOGRAMS AND ANALYSIS OF VARIANCE
BMDP80	MISSING VALUE CORRELATION
BMDP90	MULTIDIMENSIONAL DATA DESCRIPTION
BMDP1F	TWO-WAY CONTINGENCY TABLES
BMDP1M	CLUSTER ANALYSIS ON VARIABLES
BMDP2M	CLUSTER ANALYSIS ON CASES
BMDP3M	BLOCK CLUSTERING
BMDP4M	FACTOR ANALYSIS
BMDP6M	CANONICAL CORRELATION ANALYSIS
BMDP7M	STEPWISE DISCRIMINANT ANALYSIS
BMDP1R	MULTIPLE LINEAR REGRESSION
BMDP2R	STEPWISE REGRESSION
BMDP3R	NONLINEAR REGRESSION
BMDP4R	REGRESSION ON PRINCIPAL COMPONENTS
BMDP5R	POLYNOMIAL REGRESSION
BMDP6R	PARTIAL CORRELATION AND MULTIVARIATE REGRESSION
BMDP1S	MULTIPASS TRANSFORMATION
BMDP3S	NONPARAMETRIC STATISTICS
BMDP1V	ONE-WAY ANALYSIS OF VARIANCE AND COVARIANCE
BMDP2V	ANALYSIS OF VARIANCE AND COVARIANCE, INCLUDING REPEATED MEASURES

*** MNSRDC ***

THE COMPUTER CENTER MAINTAINS SOME LOCALLY WRITTEN AND/OR SUPPORTED SCIENTIFIC PROGRAMS IN THE PUBLIC ACCESS LIBRARY CALLED 'MNSRDC'. PROGRAMS IN THE LIBRARY MAY BE EXECUTED IN ONE OF THE FOLLOWING WAYS:

A) ATTACH,MNSRDC.
LIBRARY,MNSRDC. OR LDSET,LIB=MNSRDC.
PROG,<PARAMETERS>. WHERE PROG IS THE DESIRED PROGRAM

B) BEGIN,MNSRDC,,PROG,<PARAMETERS>.

REFERENCE: CCLIB/M. BECAUSE THERE ONLY TWO ROUTINES IN MNSRDC, ONLY A COMPUTER COPY OF THE MANUAL IS AVAILABLE. WHEN THERE IS A SUFFICIENT NUMBER OF ROUTINES IN MNSRDC, CCLIB/M WILL BE PUBLISHED FORMALLY. ADDITIONS TO THE LIBRARY ARE WELCOME.

LIBRARY 'MNSRDC' CONTAINS THE FOLLOWING PROGRAM:

PLRG	POLYNOMIAL REGRESSION (IBM SSP SAMPLE PROGRAM MODIFIED)
POLYMUL	ROOTS OF A POLYNOMIAL WITH COMPLEX COEFFICIENTS BY MULLER'S METHOD

*** SPSS ***

STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES (SPSS) IS AN OPEN-ENDED INTEGRATED SYSTEM OF STATISTICAL PROGRAMS EMBEDDED IN A SINGLE CONTROL PROGRAM. THE CDC 6000 VERSION WAS OBTAINED FROM NORTHWESTERN UNIVERSITY AND IS MAINTAINED BY ONE OF OUR CUSTOMERS (THE CONSTRUCTION ENGINEERING RESEARCH LABORATORY (CERL), COMPUTER SERVICES BRANCH). SPSS IS A BATCH SYSTEM WRITTEN MOSTLY IN FORTRAN. THIS PACKAGE (VERSION 6) IS MORE VERSATILE THAN THE BIMEO ROUTINES (PAGE 2-1), SINCE MANY DIFFERENT STATISTICS CAN BE PERFORMED ON THE SAME DATA IN ONE RUN.

REFERENCES: "SPSS, SECOND EDITION", NIE, HULL, JENKINS, STEINBRENNER AND BENT, MCGRAW-HILL, 1975.

"SPSS PRIMER", KLECKA, NIE AND HULL, MCGRAW-HILL, 1975.

'SPSS' CONTAINS THE FOLLOWING DATA-CARD-CALLABLE PROCEDURES:

AGGREGATE	DESCRIPTIVE GROUP STATISTICS FOR SPECIFIED VARIABLES WRITTEN TO RAW OUTPUT FILE
ANCOVA	ONE- TO FIVE-WAY ANALYSIS OF VARIANCE AND COVARIANCE FOR FACTORIAL DESIGNS
BREAKDOWN	DESCRIPTIVE STATISTICS ON SUBGROUPS
CANCORR	CANONICAL CORRELATION ANALYSIS AND TESTS OF STATISTICAL SIGNIFICANCE
CONDESCRIPTIVE	DESCRIPTIVE STATISTICS FOR CONTINUOUS (UNGROUPED) VARIABLES
CROSSTABS	2-WAY TO N-WAY JOINT FREQUENCY DISTRIBUTION, CONTINGENCY TABLES AND RELATED MEASURES OF ASSOCIATION
DISCRIMINANT	MULTIPLE DISCRIMINANT ANALYSIS IN STEPWISE OR DIRECT MODE
FACTOR	FACTOR ANALYSIS BY ONE OF FIVE DIFFERENT METHODS
FREQUENCIES	ONE-WAY FREQUENCY DISTRIBUTIONS WITH DESCRIPTIVE STATISTICS
GUTTMAN SCALE	UP TO 50 SEPARATE GUTTMAN SCALES BY VARIANT OF GOOD ENOUGH TECHNIQUE
G3SLS	GENERALIZED AND 3-STAGE LEAST SQUARES ESTIMATES OF THE PARAMETERS OF A SYSTEM OF SIMULTANEOUS STOCHASTIC EQUATIONS
JFACTOR	JORFESKOG FACTOR ANALYSIS FOR GENERALIZED LEAST SQUARES, MAXIMUM LIKELIHOOD, AND UNWEIGHTED LEAST SQUARES
MANCOVA	MULTIVARIATE ANALYSIS OF VARIANCE AND COVARIANCE WITH UNEQUAL CELL FREQUENCIES

NONLINEAR	NONLINEAR REGRESSION BY MINIMIZING SUMS OF SQUARES
NONPAR CORR	SPEARMAN AND/OR KENDALL RANK-ORDER CORRELATION COEFFICIENTS AND LEVEL OF SIGNIFICANCE
NPAR TESTS	13 NONPARAMETRIC STATISTICAL TESTS
ONEWAY	ONE-WAY ANALYSIS OF VARIANCE WITH RANGE TESTS
PARTIAL CORR	UP TO 25 SETS OF PARTIAL CORRELATIONS OF ANY ORDER OR COMBINATION - LEAST SQUARES REGRESSION IN MULTIPLE OR STEPWISE MODE
PEARSON CORR	PEARSON PRODUCT-MOMENT (ZERO-LEVEL) CORRELATION COEFFICIENTS AND LEVEL OF SIGNIFICANCE
RELIABILITY	COEFFICIENTS OF RELIABILITY AND OTHER SUMMARY STATISTICS FOR EVALUATING MULTIPLE ITEM SCALES
SCATTERGRAM	SCATTER DIAGRAM OF DATA POINTS AND SIMPLE REGRESSION
SUMMARY TABLES	TABLES (PERCENTAGES AND OPTIONAL CELL COUNTS) WHICH SUMMARIZE RELATIONSHIPS BETWEEN INDEPENDENT VARIABLE AND A NUMBER OF DICHOTOMOUS DEPENDENT VARIABLES
TETRACHORIC	TETRACHORIC CORRELATION COEFFICIENTS BETWEEN DICHOTOMOUS VARIABLES
T-TEST	STUDENT'S T AND PROBABILITY LEVELS TESTS ON SAMPLE MEANS

*** UTILITY ***

THE COMPUTER CENTER MAINTAINS SOME LOCALLY WRITTEN AND/OR SUPPORTED UTILITIES IN THE PUBLIC ACCESS LIBRARY CALLED 'UTILITY'. PROGRAMS IN THIS LIBRARY MAY BE EXECUTED IN ONE OF THE FOLLOWING WAYS:

- A) ATTACH,UTILITY.
LIBRARY,UTILITY. OR LDSET,LIB=UTILITY.
PROG,<PARAMETERS>. WHERE PROG IS THE DESIRED PROGRAM
- B) BEGIN,UTILITY,,PROG,<PARAMETERS>.

REFERENCES: ALL OF THESE PROGRAMS ARE DOCUMENTED IN CCLIB/U, WHICH MAY BE OBTAINED FROM USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROGRAM 'PROGDOC' (SEE PAGE 1-2).

LIBRARY 'UTILITY' CONTAINS THE FOLLOWING PROGRAMS:

AUDSCRT	PRINT SORTED AUDIT
BANNER	PRINT A BANNER (PAGE)
BANNER3	PRINT 3 BANNERS ON ONE PAGE
BINDEX	GIVE LIST AND SORTED LIST OF OUTPUT OF EDITLIB 'LISTLIB' AND 'CONTENT' DIRECTIVES
CARDS	REPRODUCE A BCD DECK WITH MODIFICATIONS (FIELDS MAY BE MOVED, DELETED, INTERCHANGED, GANG PUNCHED AND/OR SEQUENCED)
CARDS2	REPRODUCE A BCD DECK WITH MODIFICATIONS (FIELDS MAY BE COPIED, MOVED, DELETED, INTERCHANGED, GANG PUNCHED AND/OR SEQUENCED)
CCRM	EXTRACT ALL PAGES FROM COMPUTER CENTER REFERENCE MANUAL WHICH WERE MODIFIED AFTER USER-SPECIFIED DATE
COPYEXT	COPY UNIT RECORDS (ZERO BYTE TERMINATED) EXTRACTING SPECIFIED COLUMNS AND OPTIONALLY MOVING THEM AND OPTIONALLY ADD EDITOR SEQUENCING
COPYLIB	FROM AN EDITLIB LISTLIB LISTING, CREATE SORTED (OR UNSORTED) DIRECTIVES TO COPY AN EDITLIB USER LIBRARY
COPYRE	COPY AND REARRANGE FILE OF ZERO BYTE TERMINATED RECORDS (150 CHARACTERS MAXIMUM PER RECORD)
COPYSEL	COPY AND REARRANGE FILE OF ZERO BYTE TERMINATED RECORDS (150 CHARACTERS MAXIMUM PER RECORD; FILE PROCESSED DIRECTLY)
CV29	CONVERT TO 029 PUNCH CODE

DECK LIST UPDATE 'SOURCE' FILE DECK/COMDECK NAMES, SEQUENCE NUMBER AND NUMBER OF CARDS

DECKLIST LIST UPDATE 'SOURCE' FILE DECK/COMDECK NAMES, SEQUENCE NUMBER, NUMBER OF CARDS, NUMBER OF LINES AND PAGES (IF COLUMN 1 CARRIAGE CONTROL IS USED) (LIST CONTENTS OF A DOCUMENTATION FILE)

DEKSORT SORT IDENT AND DECK LISTINGS FROM UPDATE OUTPUT FILE

OFOATIM PUT DATE/TIME IN DAYFILE

QMPFIL DUMP FIRST N WORDS OF EACH LOGICAL RECORD IN M FILES

DOC PREPARE (SUB)PROGRAM AND CATALOGUED PROCEDURE DOCUMENTATION

DOCIT ADD PAGING TO A DOCUMENT

DOCUMNT MAINTAIN A FILE OF DOCUMENTS

EXECARD EXTRACT EXECUTE CARD PARAMETER/SUBPROGRAM USAGE/PROCEDURE USAGE INFORMATION FROM DOCUMENTATION FILES (WHICH WERE PREPARED IN THE FORMAT GENERATED BY PROGRAM 'DOC')

FORMATR THIS IS A TEXT FORMATTER. IT IS DESIGNED TO BE OF ASSISTANCE TO THE PERSON WHO NEEDS TO MANIPULATE TEXT FILES WHICH ARE NOT INHERENTLY LINE ORIENTED. IT WILL ACCEPT FREE-FORM INPUT AND GENERATE FORMATTED OUTPUT UTILIZING ARBITRARILY SIZED RECORDS. THE INPUT CONSISTS OF TEXT AND OPTIONAL DIRECTIVES WHICH CONTROL SUCH FUNCTIONS AS PARAGRAPH INDENTING AND LINE SPACING.

GETOBJ EXTRACT ONE OBJECT MODULE FROM A SEQUENTIAL OBJECT FILE OR AN EDITLIB USER LIBRARY

HEXOMP DUMP 9-TRACK TAPE IN HEXADECIMAL FORMAT

JOBTIMF PUT JOB CP EXECUTION TIME TO THIS POINT INTO DAYFILE

LINER COUNT LINES AND PAGES OF A FILE HAVING FIRST CHARACTER CARRIAGE CONTROL

LINERL LIST A DOCUMENT (CARRIAGE CONTROL IN COLUMN 1, ZERO BYTE TERMINATED RECORDS) WITH RECORD COUNT AND COUNT OF LINES ON EACH PAGE (LIST THRU END-OF-INFORMATION)

LISTPTN LIST RELOCATABLE BINARY MODULES IN ONE OR MORE FILES

LISTCMP LIST AN UPDATE COMPILE FILE, EACH DECK BEGINNING ON A NEW PAGE WITH A BANNER PAGE PRECEDING IT

LISTEOI LIST A FILE INSERTING *EOR, *EOF, *EOI WHERE APPROPRIATE

LISTZ LIST ZERO BYTE TERMINATED RECORDS (UP TO 110 CHARACTERS PER RECORD) WITH RECORD NUMBER AND RECORD LENGTHS

LIST1 LIST (CENTERED) ONE COPY OF CARDS (UP TO 90 CHARACTERS) HAVING CARRIAGE CONTROL IN COLUMN 1. OPTIONALLY PRINT CARD, PAGE AND LINE COUNTS AND LINE LENGTHS.

LIST2 SINGLE/DOUBLE SPACE LISTING, 6 OR 8 LINES PER INCH, WITH OPTIONAL SKIP OVER PERFORATION AT BOTTOM OF PAGE (FIRST 120 CHARACTERS)

LIST3 LIST FIRST (UP TO 90-CHARACTER, ZERO BYTE TERMINATED) RECORD IN EACH LOGICAL RECORD THROUGH EOI

LIST4 LIST UNIT RECORDS, THRU EOI, WHICH HAVE '1' IN COLUMN 1

MANYDOC EXTRACT (PRINT) TWO OR MORE DOCUMENTS FROM A DOCUMENTATION FILE

MPSCM CONVERT PRINTED OUTPUT DATA INTO A COM FORMATTED TAPE TO PRODUCE MICROFICHE ON THE DATAGRAPHIX 4530 SYSTEM

MTDOC CREATE DOCUMENTATION TO DESCRIBE THE CONTENTS OF A MAGNETIC TAPE

PAGEPRT PRINT SELECTED PAGE(S) FROM A DOCUMENT

PFOOC CREATE PERMANENT FILE DOCUMENTATION

PROGDOC EXTRACT (PRINT) ONE OR ALL DOCUMENT(S) FROM A DOCUMENTATION FILE

PROMT MAINTAIN AN ALPHABETICAL, SEQUENTIAL PROCEDURE FILE, EACH PROCEDURE BEING ONE SCOPE LOGICAL RECORD

PRUDMP OCTAL AND CHARACTER DUMP OF DISK FILE BY RELATIVE PRU NUMBER

PTIM PRINT CPA, CPB, CPA+CPB, IO AND PP TIMES SINCE START OF JOB OR INTERCOM SESSION

PURPOSE EXTRACT PURPOSE INFORMATION FROM DOCUMENTATION FILES (WHICH WERE PREPARED IN THE FORMAT GENERATED BY PROGRAM 'DOC')

REDECK CHANGE AN UPDATE COMPILE FILE BACK INTO A SOURCE FILE

SORTUP GENERATE UPDATE DIRECTIVES TO SORT OLDPL

TAPDMP DUMP SELECTED PORTIONS OF A 7-TRACK MAGNETIC TAPE WRITTEN IN AN UNKNOWN DENSITY AND/OR MODE. IT IS CONTROLLED BY A SERIES OF FREE-FIELD CONTROL CARDS CONTAINING ORDERS FOR THE DUMPING, SKIPPING OR BACKSPACING OF RECORDS OR FILES.

TAPLIST PREPARE TWO LISTS FROM MAGTAPEDOCUMENTATION FILE:
1) TAPE NUMBER, LABEL, DENSITY, REMARKS AND DESCRIPTION FOR EACH TAPE DOCUMENTED IN FILE
2) LIST OF TAPE NUMBERS AND LABELS

UNDOCIT REMOVE THE PAGING WHICH WAS ADDED TO A DOCUMENT BY PROGRAM
'DOCIT'

WHATLIB LIST LIBRARIES SPECIFIED ON LAST LIBRARY CARD

WHICHMF TELL TELETYPE USER WHICH MAINFRAME HE IS USING

WHICHOS TELL TELETYPE USER WHICH OPERATING SYSTEM HE IS USING

*** PROGRAMS NOT IN LIBRARIES ***

SEVERAL PROGRAMS WHICH ARE NOT IN LIBRARIES ARE LISTED BELOW. (SEE THEIR INDIVIDUAL DOCUMENTS FOR ATTACH AND EXECUTE INFORMATION.)

INDIVIDUAL DOCUMENTS MAY BE PRINTED BY:

BEGIN,UTILITY,,PROGDOC,OTHER,,<PROG>,OUTPUT.

WHERE <PROG> IS THE NAME OF THE PROGRAM WHOSE DOCUMENTATION IS DESIRED. THE LENGTH OF EACH DOCUMENT IS GIVEN IN PARENTHESES.

BEGIN HOW TO WRITE AND EXECUTE A CATALOGUED PROCEDURE (29 PAGES)

COPYBFR * RECREATE A CDC 'RANDOM' FILE FROM DATA COPIED EARLIER TO A SEQUENTIAL FILE, OR COPY A RANDOM FILE. IT MAY BE USED TO RECREATE A PROPER OLOPL IF COPYBF WAS USED ERRONEOUSLY. (2 PAGES)

COPYE * COPY A FILE TO END-OF-INFORMATION (2 PAGES)

COPYF * COPY BINARY OR CODED FILES (2 PAGES)

COPYR * COPY BINARY OR CODED RECORDS (2 PAGES)

COPYRM * COPY AND CONVERT RECORDS ON SEQUENTIAL (SQ) FILES FROM ONE RECORD TYPE AND BLOCK STRUCTURE TO ANOTHER (2 PAGES)

COPYS A GENERAL PURPOSE UTILITY FROM NORTHWESTERN UNIVERSITY WHICH PROVIDES A LARGE VARIETY OF COPY OPERATIONS FOR SEQUENTIAL OR RANDOM FILES (3 PAGES)

COPYSF * COPY FILES OR RECORDS WITH OPTIONAL SHIFT TO RIGHT (3 PAGES)

CVT360 CONVERT DOUBLE PRECISION S/360 FORTRAN PROGRAMS TO SINGLE PRECISION CDC FORTRAN (1 PAGE)

MNF MINNESOTA FORTRAN (MNF) IS AN ALTERNATIVE COMPILER WHICH COMPILES FASTER THAN FTN AND HAS MORE DIAGNOSTICS AND SIMPLER DEBUG FACILITIES (8 PAGES AT 8 LINES PER INCH)

NETED AN ELEMENTARY TEXT EDITOR HAVING SOME FEATURES NOT AVAILABLE IN THE INTERCOM EDITOR (20 PAGES)

RATFOR PRE-COMPILER TO CONVERT RATIONAL FORTRAN TEXT INTO CDC FTN TEXT. RATIONAL FORTRAN IS A PROGRAMMING LANGUAGE WHICH HAS THE STRUCTURE FORMING STATEMENTS THAT ALLOW 'TOP DOWN' AND 'GO TO-LESS' PROGRAMMING. (12 PAGES)

RNF TEXT FORMATTING PROGRAM PROVIDING ANY OR ALL OF: PAGINATION, LINE FILLING, RIGHT MARGIN JUSTIFICATION, CHAPTERING, SECTIONING, NUMBERED LISTS AND SUBLISTS, MACRO FACILITY. (PORTIONS OF THIS MANUAL WERE PREPARED USING RNF) (47 PAGES)

* - CCRM HAS SUFFICIENT INFORMATION TO EXECUTE THESE PROGRAMS. THE DOCUMENTS CONTAIN ADDITIONAL PARAMETERS AND OTHER INFORMATION.

***** SUBPROGRAMS *****

THE COMPUTER CENTER MAINTAINS SEVERAL LIBRARIES OF SUBPROGRAMS IN RELOCATABLE OBJECT FORM. THIS CHAPTER DESCRIBES THE FOLLOWING LIBRARIES AND LISTS THE CONTENTS OF EACH WITH DESCRIPTIVE TITLES (REFERENCES ARE GIVEN FOR THE WRITE-UPS):

ARLNLG - AEROSPACE RESEARCH LABORATORIES LINEAR ALGEBRA LIBRARY
 EDSTAT - EDSTAT-P AND EDSTAT-V ROUTINES FOR STATISTICAL ANALYSIS OF BEHAVIORIAL SCIENCE DATA
 EISPACK - SOLVE EIGENVALUE AND EIGENVECTOR PROBLEMS
 FUNPACK - SPECIAL FUNCTIONAL SUBROUTINE PACKAGE FROM ARGONNE NATIONAL LABORATORY
 IMSL - INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARIES PACKAGE
 MSL - CDC MATH SCIENCE LIBRARY
 NSRDC - DTNSRDC WRITTEN AND/OR SUPPORTED SCIENTIFIC AND UTILITY SUBROUTINES

THESE ROUTINES ARE USED PRIMARILY WITH FTN, MNF OR RATFOR PROGRAMS AND MOST ARE CODED IN FTN.

TO ACCESS ANY LIBRARY:

ATTACH,<LIB>.	
LOSET,LIB=<LIB>.	OR LIBRARY,<LIB>.
LGO.	OR OTHER LOAD AND EXECUTE CARD(S)

FOR EXAMPLE,

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JOBNAME.
CHARGE,....
FTN.
ATTACH,NSRDC.
LOSET,LIB=NSRDC.
LGO.
' 7/8/9      EOR
  PROGRAM TEST (INPUT=128, OUTPUT=128)
  ...
  CALL ANOVA1 (...)
  ...
  END
' 7/8/9      EOR
  (DATA CARDS)
" 6/7/8/9    EOF
  
```

INDIVIDUAL MACHINE-READABLE DOCUMENTS, WHEN AVAILABLE, MAY BE PRINTED (SEE PAGE 1-2).

ARLNALG

THE AEROSPACE RESEARCH LABORATORIES (ARL) LINEAR ALGEBRA LIBRARY IS A COLLECTION OF 34 SUBROUTINES FOR SOLUTIONS TO LINEAR SYSTEMS AND DETERMINATION OF EIGENVALUES AND EIGENVECTORS OF REAL SYMMETRIC MATRICES. SOME OF THESE ROUTINES ARE SPECIFICALLY OPTIMIZED FOR THE CDC 6000 SERIES COMPUTERS.

REFERENCES: THE ARL LINEAR ALGEBRA LIBRARY HANDBOOK, NIKOLAI AND TSAO, AEROSPACE RESEARCH LABORATORIES, DAYTON, OHIO, JULY 1974, ARL TR 74-0106.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'ARLNALG' INCLUDE:

BAC1	EIGENVECTORS OF A SYMMETRIC MATRIX FROM THOSE OF ITS TRIDIAGONAL FORM
BAC2	EIGENVECTORS OF A SYMMETRIC MATRIX FROM THOSE OF ITS TRIDIAGONAL FORM
BISEC	EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX BY THE BISECTION METHOD
FIP	FAST INNER PRODUCT EVALUATION OPTIMIZED FOR THE CDC 6000
IMPR1	ITERATIVE IMPROVEMENT TO MACHINE ACCURACY OF THE SOLUTION X OF $AX = B$ OBTAINED USING SUBROUTINE LEQS1
IMPR2	ITERATIVE IMPROVEMENT TO MACHINE ACCURACY OF THE SOLUTION X OF $AX = B$ OBTAINED USING SUBROUTINE LEQS2
IMCL1	EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC MATRIX
INIT	EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX BY INVERSE ITERATION
LEQS1	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU1
LEQS2	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU2
LEQS3	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU3
LEQS4	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU4
LEQS5	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU5
LEQS6	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU6

LU1 LU FACTORIZATION OF A REAL SQUARE MATRIX

LU2 LU FACTORIZATION OF A REAL SQUARE MATRIX BY THE CROUT METHOD WITH ACCUMULATING INNER PRODUCTS

LU3 LU FACTORIZATION OF A REAL SQUARE MATRIX

LU4 LU FACTORIZATION OF A REAL BAND MATRIX A TOGETHER WITH THE NUMBER OF POSITIVE EIGENVALUES IF A IS SYMMETRIC

LU5 CHOLESKY FACTORIZATION OF A POSITIVE DEFINITE REAL SYMMETRIC MATRIX

LU6 CHOLESKY FACTORIZATION OF A POSITIVE DEFINITE REAL SYMMETRIC BAND MATRIX

ORIMP ITERATIVE IMPROVEMENT OF THE SOLUTION X OF $AX = B$ OBTAINED USING SUBROUTINE ORSOL

ORSOL LEAST SQUARES SOLUTION OF A LINEAR SYSTEM GIVEN AN ORTHOGONAL-TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY SUBROUTINE ORTHO

ORTHO ORTHOGONAL TRANSFORMATION OF A GIVEN GENERAL M BY N MATRIX A TO UPPER TRIANGULAR FORM

ORTH02 ORTHOGONAL TRANSFORMATION OF A GENERAL M BY N MATRIX A TO UPPER TRIANGULAR FORM AND THE SOLUTION OF THE ASSOCIATED LINEAR LEAST SQUARES PROBLEM

OZABX SOLUTION OF THE GENERALIZED MATRIX EIGENVALUE PROBLEM USING THE OZ ALGORITHM

REBAK4 RECOVERY OF EIGENVECTORS OF GENERALIZED SYMMETRIC EIGENVALUE PROBLEM FROM THOSE OF STANDARD FORM PRODUCED BY REDUC1

REDUC1 REDUCTION OF THE GENERALIZED SYMMETRIC EIGENVALUE PROBLEM TO STANDARD FORM

RITZIT ITERATIVE COMPUTATION OF EIGENVALUES LARGEST IN MAGNITUDE AND CORRESPONDING EIGENVECTORS OF A REAL SYMMETRIC MATRIX

RNCL1 EIGENVALUES OF A REAL SYMMETRIC TRIDIAGONAL MATRIX

SVD SINGULAR VALUE DECOMPOSITION OF A REAL RECTANGULAR MATRIX

TRI1 FAST HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX

TRI2 COMPACT HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX

TRI3 FAST HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX FOR THE QL ALGORITHM

TRI4 HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX FOR THE QL ALGORITHM

EDSTAT (PROPRIETARY)

LIBRARY EDSTAT CONTAINS BOTH THE EDSTAT-P AND EDSTAT-V ROUTINES FOR STATISTICAL ANALYSIS OF BEHAVIORAL SCIENCE DATA WHICH WERE OBTAINED FROM DATA SCIENCES ASSOCIATES, AUSTIN, TEXAS.

SUBROUTINES IN LIBRARY 'EDSTAT' INCLUDE:

AEVS	ROOTS AND VECTORS OF AN ASYMMETRIC MATRIX
ANOVAR	GROUPS-BY-TRIALS ANALYSIS OF VARIANCE (WITH A SINGLE GROUP OR A SINGLE TRIAL, RESULTS ARE EQUIVALENT TO T-TESTS)
AVAR23	DOUBLE- OR TRIPLE-CLASSIFICATION FACTORIAL ANALYSIS OF VARIANCE, WITH PROVISION FOR UNEQUAL NUMBERS OF SCORES PER CELL
AVTRND	ANALYSES OF VARIANCE (ONE FOR EACH DEPENDENT VARIABLE) FOR REPEATED MEASUREMENT DESIGNS HAVING RANDOMIZED OR FACTORIAL CLASSIFICATION OF SUBJECT GROUPS. TREND COMPONENTS (LINEAR, QUADRATIC, CUBIC AND QUARTIC) ARE ANALYZED. EQUAL NUMBER OF SUBJECTS PER GROUP IS REQUIRED.
AXBS	MATRIX MULTIPLICATION
BETWEEN	ANALYSES OF VARIANCE (ONE FOR EACH DEPENDENT VARIABLE) FOR MULTIPLE CLASSIFICATION FACTORIAL DESIGNS HAVING 1-6 LEVELS OF CLASSIFICATION
BETWITH	ANALYSES OF VARIANCE (ONE FOR EACH DEPENDENT VARIABLE) FOR DESIGNS HAVING BOTH BETWEEN-SUBJECT DIMENSIONS AND WITHIN-SUBJECT DIMENSIONS. BETWEEN DIMENSIONS MAY BE RANDOMIZED GROUPS OR FACTORIALY CLASSIFIED SUBJECT-GROUP DIMENSIONS. WITHIN DIMENSIONS MAY BE REPEATED MEASURES (TEST-RETEST OR TRIALS) OF 1-4 DIMENSIONS. BETWEEN-SUBJECT CELL FREQUENCIES NEED NOT BE EQUAL.
CANONA	MULTIPLE CANONICAL CORRELATION ANALYSIS
CHICHI	CHI-SQUARE ANALYSIS OF FREQUENCY DATA IN BIVARIATE TABLES, OR UNIVARIATE TESTS AGAINST HYPOTHESIZED EQUAL OR SPECIFIC DISTRIBUTIONS
CONTAB	BIVARIATE FREQUENCY TABLES FOR ALL PAIRINGS OF A SERIES OF ONE-CHARACTER ALPHAMERIC VARIABLES, WITH PROVISION FOR SELECTING LESS THAN ALL POSSIBLE PAIRINGS
CORREL	MEANS, STANDARD DEVIATIONS AND CORRELATIONS (MISSING DATA ALLOWED)
CORS	MEANS, SIGMAS AND INTERCORRELATIONS
DISTAT	DESCRIPTIVE STATISTICS, FREQUENCY DISTRIBUTIONS, AND STANDARD SCORE CONVERSIONS FOR A SERIES OF VARIABLES
DISCRIM	MULTIPLE DISCRIMINANT ANALYSIS, INCLUDING UNIVARIATE COMPARISONS OF GROUPS

FACTOR	INTERCORRELATION, PRINCIPAL-AXIS ANALYSIS, VARIMAX ROTATION, AND FACTOR-SCORE COMPUTATION, WITH PROVISIONS FOR MISSING DATA AND TRANSPOSED (SUBJECT PROFILE) ANALYSIS
FREQCY	FREQUENCY COUNTS
HGRUP	GENERALIZED DISTANCE ANALYSIS TO SUCCESSIVELY CLUSTER SUBJECTS OF VARIABLES (ALL STAGES OF REDUCTION FROM N ONE-PERSON GROUPS TO ONE N-PERSON GROUP ARE REPORTED)
ING	TRACING SUBROUTINE FOR EDSTAT DEBUGGING
INVS	MATRIX INVERSION
LAGCOR	AUTOCORRELATION AND CROSS-LAG CORRELATIONS; DETECTING CYCLIC FLUCTUATION IN A SERIES OF MEASURES OF ONE OR MORE VARIABLES
MORS	MISSING-DATA INTERCORRELATION
PCDS	PUNCH OUTPUT OF AN ARRAY
PRBF	CHANCE PROBABILITY OF AN F-RATIO
PRTS	PRINT OUTPUT OF AN ARRAY
REGAN	ITERATIVE MULTIPLE REGRESSION ANALYSIS, WITH PROVISION FOR MULTIPLE EQUATIONS, COMPARISON OF EQUATIONS BY F-TESTS, AND OUTPUT OF PREDICTED SCORES FOR SUBJECTS
RELATE	COMPARISON OF FACTOR STRUCTURES THROUGH REROTATION TO MAXIMIZE ITEM-VECTOR CONTIGUITY
RTMS	PUNCH OUTPUT OF A SYMMETRIC MATRIX
SCPF	SCALAR PRODUCT OF TWO VECTORS
SEVS	ROOTS AND VECTORS OF A SYMMETRIC MATRIX
SUBS	PUNCH OUTPUT OF A SCORE VECTOR
SUMF	SUMS AND SUMS OF SQUARES OF A VECTOR
TOPS	TRANSPOSED-DATA INTERCORRELATION
TESTAT	SCORING AND ITEM-ANALYSIS OF DATA FROM CHOICE-RESPONSE INSTRUMENTS, EITHER RIGHT-WRONG OR TIME-SUM SCALES
TSCALE	THRUSTONIAN SUCCESSIVE-INTERVALS SCALE CONSTRUCTION
TTESTS	MULTIPLE GROUPS ANALYSES OF VARIANCE AND SELECTED GROUPS T-TESTS (SCHEFFE METHOD)
VORS	VARIMAX ROTATION OF A FACTOR STRUCTURE
WITHIN	ANALYSES OF VARIANCE (ONE FOR EACH DEPENDENT VARIABLE) FOR FACTORIAL DESIGNS IN WHICH EQUAL NUMBER OF SUBJECTS PER GROUP ARE MATCHED, OR FOR DESIGNS HAVING FACTORIALLY CLASSIFIED REPEATED MEASURES UPON ONE GROUP OF SUBJECTS

EISPACK

THE EIGENSYSTEM PACKAGE FROM ARGONNE NATIONAL LABORATORY IS A COLLECTION OF 35 SUBROUTINES TO SOLVE EIGENVECTOR AND EIGENVALUE PROBLEMS. ROUTINES IN THIS PACKAGE ARE OFTEN SUPERIOR IN SPEED AND ACCURACY TO SIMILAR ROUTINES IN OTHER PACKAGES.

REFERENCES: LECTURE NOTES IN COMPUTER SCIENCE, VOLUME 6, "MATRIX EIGENSYSTEM ROUTINES - EISPACK GUIDE", SMITH, ET AL, SPRINGER-VERLAG, BERLIN-HEIDELBERG-NEW YORK, 1974

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'EISPACK' INCLUDE:

BAKVEC	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY FIGI
BALANC	BALANCE A REAL GENERAL MATRIX
BALBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT REAL MATRIX TRANSFORMED BY BALANC
BANDR	REDUCE A REAL SYMMETRIC BAND MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS
BANDV	DETERMINE SOME EIGENVECTORS OF A REAL SYMMETRIC BAND MATRIX OR SOLVE BAND EQUATIONS
BISECT	DETERMINE SOME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
BDR	DETERMINE SOME EIGENVALUES OF A REAL SYMMETRIC BAND MATRIX
CBABK2	BACK TRANSFORM THE EIGENVECTORS OF THAT COMPLEX MATRIX TRANSFORMED BY CBAL
CBAL	BALANCE A COMPLEX GENERAL MATRIX
CG	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX GENERAL MATRIX
CH	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX HERMITIAN MATRIX
CINVT	DETERMINE THOSE EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES
COMBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY COMHES
COMHES	REDUCE A COMPLEX GENERAL MATRIX TO COMPLEX UPPER HESSENBERG FORM USING ELEMENTARY TRANSFORMATIONS
COMLR	DETERMINE THE EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX

COMLR2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX
COMQR	DETERMINE THE EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX
COMQR2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX HESSENBERG MATRIX
CORTE	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY CORTH
CORTH	REDUCE A COMPLEX GENERAL MATRIX TO UPPER HESSENBERG FORM USING UNITARY TRANSFORMATIONS
ELMBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY ELMHES
ELMHES	REDUCE A REAL GENERAL MATRIX TO UPPER HESSENBERG FORM USING ELEMENTARY TRANSFORMATIONS
ELTRAN	ACCUMULATE THE TRANSFORMATIONS IN THE REDUCTION OF A REAL GENERAL MATRIX BY ELMHES
FIGI	TRANSFORM A CERTAIN REAL NON-SYMMETRIC TRIDIAGONAL MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX
FIGI2	TRANSFORM A CERTAIN REAL NON-SYMMETRIC TRIDIAGONAL MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX ACCUMULATING THE DIAGONAL TRANSFORMATIONS
HQR	DETERMINE THE EIGENVALUES OF A REAL UPPER HESSENBERG MATRIX
HQR2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX
HTPIBK	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY HTRIDI
HTPIB3	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY HTRID3
HTRIDI	REDUCE A COMPLEX HERMETIAN MATRIX TO A REAL SYMMETRIC TRIDIAGONAL MATRIX USING UNITARY TRANSFORMATIONS
HTRID3	REDUCE A COMPLEX HERMETIAN MATRIX, STORED AS A SINGLE SQUARE ARRAY, TO A REAL SYMMETRIC TRIDIAGONAL MATRIX USING UNITARY TRANSFORMATIONS
INTQLV	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
INTQL1	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
INTQL2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX
INVIT	DETERMINE THOSE EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES

MTNFIT COMPUTE THE SINGULAR VALUE DECOMPOSITION OF AN ARBITRARY REAL RECTANGULAR MATRIX AND THE SOLUTION OF A RELATED LINEAR LEAST SQUARES PROBLEM

ORTPAK BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY ORTHES

ORTHES REDUCE A REAL GENERAL MATRIX TO UPPER HESSENBERG FORM USING ORTHOGONAL TRANSFORMATIONS

ORTRAN ACCUMULATE THE TRANSFORMATIONS IN THE REDUCTION OF A REAL GENERAL MATRIX BY ORTHES

OZHFS SIMULTANEOUSLY REDUCE ONE OF A PAIR OF REAL GENERAL MATRICES TO UPPER HESSENBERG FORM AND THE OTHER TO UPPER TRIANGULAR FORM USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS

OZIT REDUCE ONE OF A PAIR OF REAL MATRICES FROM UPPER HESSENBERG TO QUASI-UPPER TRIANGULAR FORM WHILE MAINTAINING THE UPPER TRIANGULAR FORM OF THE OTHER USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS

OZVAL EXTRACT THE GENERALIZED EIGENVALUES OF A REAL MATRIX SYSTEM WITH ONE MATRIX IN QUASI-UPPER TRIANGULAR FORM AND THE OTHER IN UPPER TRIANGULAR FORM USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS

OZVEC DETERMINE THE GENERALIZED EIGENVECTORS OF A REAL MATRIX SYSTEM WITH ONE IN QUASI-UPPER TRIDIAGONAL FORM AND THE OTHER IN UPPER TRIANGULAR FORM USING BACK SUBSTITUTION

RATGR DETERMINE SOME EXTREME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX

REBAK9 BACK TRANSFORM THE EIGENVECTORS OF THAT DERIVED SYMMETRIC MATRIX DETERMINED BY REDUC2

REBAK BACK TRANSFORM THE EIGENVECTORS OF THAT DERIVED SYMMETRIC MATRIX DETERMINED BY REDUC OR REDUC2

REDUC REDUCE A CERTAIN GENERALIZED SYMMETRIC EIGENPROBLEM TO THE STANDARD SYMMETRIC EIGENPROBLEM USING CHOLSKY DECOMPOSITION

REDUC2 REDUCE CERTAIN GENERALIZED SYMMETRIC EIGENPROBLEMS TO STANDARD SYMMETRIC EIGENPROBLEMS USING CHOLSKY DECOMPOSITION

RG DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL GENERAL MATRIX

RG6 DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL GENERAL GENERALIZED EIGENPROBLEM $A^*X = (\text{LAMBDA}) * B^*X$

RS DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC MATRIX

RSB DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC BAND MATRIX

RSG DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL SYMMETRIC GENERALIZED EIGENPROBLEM $A^*X = (LAMBDA)*B^*X$

RSGAB DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL SYMMETRIC GENERALIZED EIGENPROBLEM $A^*B^*X = (LAMBDA)*X$

RSGBA DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL SYMMETRIC GENERALIZED EIGENPROBLEM $B^*A^*X = (LAMBDA)*X$

RSP DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC PACKED MATRIX

RST DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC TRIDIAGONAL MATRIX

PT DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A CERTAIN REAL TRIDIAGONAL MATRIX

SVN COMPUTE THE SINGULAR VALUE DECOMPOSITION OF AN ARBITRARY REAL RECTANGULAR MATRIX

TINVT DETERMINE SOME EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX

TQLRAT DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX

TQL1 DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX

TQL2 DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX

TRBAK1 BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY TRED1

TRBAK3 BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY TRED3

TRF01 REDUCE A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS

TRF02 RETURN A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX ACCUMULATING THE ORTHOGONAL TRANSFORMATIONS

TRF03 REDUCE A REAL SYMMETRIC MATRIX, STORED AS A ONE-DIMENSIONAL ARRAY, TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS

TRIDR DETERMINE SOME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX

TSTURN DETERMINE SOME EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX

FUNPACK

SPECIAL FUNCTIONAL SUBROUTINE PACKAGE FROM ARGONNE NATIONAL LABORATORY CONTAINING 24 USER-CALLABLE ROUTINES FOR BESSEL FUNCTIONS, DAWSON'S INTEGRAL, ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND AND EXPONENTIAL INTEGRAL.

REFERENCES: MASTER DOCUMENTS ON FILE IN USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'FUNPACK' INCLUDE:

BESIO	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, $I_0(X)$
BESFIO	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, $\exp(-\text{ABS}(X)) * I_0(X)$
BESI1	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, $I_1(X)$
BESEI1	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, $\exp(-\text{ABS}(X)) * I_1(X)$
BESJ0	FUNCTION TO CALCULATE BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, $J_0(X)$
BESJ1	FUNCTION TO CALCULATE BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, $J_1(X)$
BESK0	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ZERO, $K_0(X)$, FOR REAL, POSITIVE X
BESFK0	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ZERO, $\exp(X) * K_0(X)$, FOR REAL, POSITIVE X
BESK1	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ONE, $K_1(X)$, FOR REAL, POSITIVE X
BESEK1	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ONE, $\exp(X) * K_1(X)$, FOR REAL, POSITIVE X
BESY	SUBROUTINE TO COMPUTE BESSEL FUNCTIONS OF THE SECOND KIND OF NON-NEGATIVE ORDER, Y-SUB-NU(X), FOR REAL, POSITIVE X (SEE YNU)
DAW	FUNCTION TO COMPUTE DAWSON'S INTEGRAL FOR ALL REAL ARGUMENTS

ELIPE	COMPUTE COMPLETE COMPLETE ELLIPTIC INTEGRALS OF THE SECOND KIND, $E(CAYSQ)$
ELIE1	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE SECOND KIND, $E(CAY^{**2})$
ELIEM	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE SECOND KIND, $E(1-ETA)$
ELIPK	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, $K(CAYSQ)$
FLIK1	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, $K(CAY^{**2})$
FLIKM	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, $K(1-ETA)$
EI	COMPUTE EXPONENTIAL INTEGRAL, $EI(X)$
FONE	COMPUTE EXPONENTIAL INTEGRAL, $E-SUB-1(X)$
EXPEI	COMPUTE EXPONENTIAL INTEGRAL, $EXP(-X)*EI(X)$
MONERR	ERROR HANDLING FACILITIES, INCLUDING USER INTERACTION, FOR FUNPACK
PSI	FUNCTION TO COMPUTE LOGARITHMIC DERIVATIVE OF THE GAMMA FUNCTION FOR REAL ARGUMENTS
YNU	FUNCTION TO COMPUTE BESSEL FUNCTIONS OF THE SECOND KIND OF NON-NEGATIVE REAL ORDER, $Y-SUB-NU(X)$, FOR REAL, POSITIVE X (SEE BESY)

IMSL (PROPRIETARY)

THE INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARIES PACKAGE CONTAINS OVER 400 SUBROUTINES IN THE FOLLOWING AREAS:

- .ANALYSIS OF EXPERIMENTAL DESIGN DATA
- .RANDOM NUMBERS, GENERATION AND TESTING
- .STATISTICS, BASIC, NON-PARAMETRIC, SPECIAL FUNCTIONS
- .REGRESSION ANALYSIS
- .DIFFERENTIAL EQUATIONS, INTERPOLATION, APPROXIMATION, SMOOTHING
- .LINEAR ALGEBRAIC EQUATIONS
- .VECTOR MATRIX ARITHMETIC

EDITION 6 OF IMSL CONTAINS ALL PREVIOUS UPDATES AND INCLUDES 39 NEW SUBROUTINES.

REFERENCES: THE IMSL LIBRARY, VOLUMES 1 AND 2.

SHORT MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'IMSL' INCLUDE:

ABALAT	ANALYZE BALANCED LATTICE DESIGN DATA. (ENTRY IN ABIBAN)
ABIBAN	ANALYZE BALANCED INCOMPLETE BLOCK DESIGN DATA
ACROAN	ANALYZE ONE-WAY CLASSIFICATION DESIGN DATA
ACTRST	COMPUTE CONTRAST ESTIMATES AND SUMS OF SQUARES
AFACAN	COMPUTE SUMS OF SQUARES AND DEGREES OF FREEDOM FOR ALL EFFECTS IN A FULL FACTORIAL PLAN
AFACMN	COMPUTE A COMPLETE SET OF MEANS FOR ALL EFFECTS IN A FULL FACTORIAL PLAN (ENTRY IN AFACAN)
AFACT	FULL FACTORIAL PLAN ANALYSIS - EASY TO USE VERSION
AGBACP	ANALYZE BALANCED COMPLETE STRUCTURE DESIGN DATA
AGLMOD	COMPUTE PARAMETER ESTIMATES, CORRESPONDING VARIANCE-COVARIANCE MATRIX ESTIMATE AND SUM OF SQUARES, FOR A GENERAL LINEAR MODEL
AGVACL	COMPUTE A ONE OR TWO-SIDED INTERVAL ESTIMATE OF A VARIANCE COMPONENT
AGXPMN	FIND EXPECTED MEAN SQUARE, DEGREES OF FREEDOM, TEST TERM AND ITS DEGREES OF FREEDOM FOR EACH MODEL TERM IN A BALANCED COMPLETE EXPERIMENTAL DESIGN STRUCTURE MODEL (ENTRY IN AGXPMS)
AGXPMS	FIND EXPECTED MEAN SQUARE, DEGREES OF FREEDOM, TEST TERM AND DEGREES OF FREEDOM, F-VALUE, AND VARIANCE COMPONENT ESTIMATE FOR EACH TERM IN ANY BALANCED COMPLETE EXPERIMENTAL DESIGN STRUCTURE MODEL

ALSCAN ANALYZE LATIN SQUARE DESIGN DATA

AMEANS PREPARE A SET OF UNBALANCED DATA FOR ANALYSIS BY THE METHOD OF UNWEIGHTED MEANS

ANCOV1 COVARIANCE ANALYSIS FOR ONE-WAY CLASSIFICATION DESIGN DATA

ANESTE ANALYZE COMPLETELY NESTED DESIGN DATA WITH EQUAL NUMBERS IN THE SUBCLASSES

ANESTU ANALYZE COMPLETELY NESTED DESIGN DATA WITH UNEQUAL NUMBERS IN THE SUBCLASSES

AORDR REORDERING OF THE DATA OBTAINED FROM ANY BALANCED COMPLETE EXPERIMENTAL DESIGN

ARCBAN ANALYZE TWO-WAY CLASSIFICATION DESIGN DATA

ASNKMC PERFORM STUDENT-NEWMAN-KEULS MULTIPLE COMPARISON TEST

BDCOU1 TALLY OBSERVATIONS INTO A ONE-WAY FREQUENCY TABLE

BDCOU2 TALLY OBSERVATIONS INTO A TWO-WAY FREQUENCY TABLE

BDTRGI TRANSGENERATE THE COLUMNS OF A MATRIX - IN CORE VERSION

BDTRGO TRANSGENERATE THE COLUMNS OF A MATRIX - OUT OF CORE VERSION

BECORI CALCULATE MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFICIENTS - IN CORE VERSION

BECORO CALCULATE MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFICIENTS - OUT OF CORE VERSION

BECVM CALCULATE MEANS AND VARIANCE-COVARIANCE MATRIX

BECTR ESTIMATE ρ IN A BIVARIATE NORMAL POPULATION (TETRACHORIC CORRELATION COEFFICIENT) WITH GROUPED OBSERVATIONS

BECVLI COMPUTE VARIANCES AND COVARIANCES OF LINEAR FUNCTIONS - IN CORE VERSION

BECVLO COMPUTE VARIANCES AND COVARIANCES OF LINEAR FUNCTIONS - OUT OF CORE VERSION

BEGFPS CALCULATE THE FIRST FOUR MOMENTS FOR GROUPED DATA ON EQUAL CLASS INTERVALS AND THE CORRESPONDING CORRECTED MOMENTS USING SHEPPARD'S CORRECTIONS

BEIGRP ESTIMATE BASIC STATISTICAL PARAMETERS USING GROUPED DATA

BEIUGR ESTIMATE BASIC STATISTICAL PARAMETERS USING UNGROUPED DATA

BELBIN INTERVAL ESTIMATE OF THE PARAMETER p OF THE BINOMIAL DISTRIBUTION

BELPOS INTERVAL ESTIMATE OF THE PARAMETER, LAMBDA, OF THE POISSON DISTRIBUTION

REMTY CALCULATE MEANS, SIMPLE REGRESSION COEFFICIENTS, THEIR INTERCEPTS, STANDARD ERRORS OF THE REGRESSION COEFFICIENTS, AND STANDARD DEVIATIONS FOR ARRAYS WHICH CONTAIN MISSING VALUES (IN CORE VERSION)

REMTRO CALCULATE MEANS, SIMPLE REGRESSION COEFFICIENTS, THEIR INTERCEPTS, STANDARD ERRORS OF THE REGRESSION COEFFICIENTS, AND STANDARD DEVIATIONS FOR ARRAYS WHICH CONTAIN MISSING VALUES (OUT OF CORE VERSION)

BFMMI CALCULATE MEANS, CORRELATION COEFFICIENTS, STANDARD DEVIATIONS AND THIRD AND FOURTH MOMENTS FOR ARRAYS WHICH CONTAIN MISSING VALUES (IN CORE VERSION)

BFMMO CALCULATE MEANS, CORRELATION COEFFICIENTS, STANDARD DEVIATIONS AND THIRD AND FOURTH MOMENTS FOR ARRAYS WHICH CONTAIN MISSING VALUES (OUT OF CORE VERSION)

REMNCN MAKE LOCATION (MEAN) INFERENCES USING A SAMPLE FROM A NORMAL POPULATION WITH KNOWN VARIANCE

REMSON MAKE MEAN AND VARIANCE INFERENCES USING A SAMPLE FROM A NORMAL POPULATION

RENSON MAKE VARIANCE INFERENCES USING A SAMPLE FROM A NORMAL POPULATION WITH KNOWN MEAN

BFPATN MAKE MEAN AND VARIANCE INFERENCES USING SAMPLES FROM EACH OF TWO NORMAL POPULATIONS WITH UNEQUAL VARIANCES (ENTRY IN BEPATS)

REPATS MAKE MEAN AND VARIANCE INFERENCES USING SAMPLES FROM EACH OF TWO NORMAL POPULATIONS WITH UNEQUAL VARIANCES, ALLOWING ANY LINEAR RELATIONSHIP BETWEEN THE POPULATION MEANS AND ANY MULTIPLICATIVE LINEAR RELATIONSHIP BETWEEN THE POPULATION VARIANCES

BEPFTN MAKE MEAN AND VARIANCE INFERENCES USING SAMPLES FROM EACH OF TWO NORMAL POPULATIONS WITH EQUAL VARIANCES (ENTRY IN BEPETS)

BEPETS MAKE MEAN AND VARIANCE INFERENCES USING SAMPLES FROM EACH OF TWO NORMAL POPULATIONS WITH EQUAL VARIANCES, ALLOWING ANY LINEAR RELATIONSHIP BETWEEN THE POPULATION MEANS

BESRB COMPUTE A BISERIAL (AND POINT-BISERIAL) CORRELATION COEFFICIENT BETWEEN VARIABLES, ONE OF WHICH IS QUALITATIVELY (BINARY) DICHOTOMIZED, AND THE OTHER IS NUMERICALLY MEASURABLE AND CLASSIFIED

BESRN COMPUTE A BISERIAL CORRELATION COEFFICIENT BETWEEN VARIABLES, ONE OF WHICH IS QUALITATIVELY DICHOTOMIZED AND THE OTHER NUMERICALLY OR QUALITATIVELY CLASSIFIED, NOT NECESSARILY ORDERED

CBNRHO MAXIMUM LIKELIHOOD ESTIMATE OF THE CORRELATION COEFFICIENT
USING A CONTINGENCY TABLE DERIVED FROM A BIVARIATE NORMAL
POPULATION

CTBNLL EVALUATE A QUANTITY PROPORTIONAL TO THE NATURAL LOGARITHM OF
THE LIKELIHOOD OF A CONTINGENCY TABLE DERIVED FROM A
BIVARIATE NORMAL POPULATION

CTRBYC ANALYSIS OF CONTINGENCY TABLE

DASCRU AUTOMATIC STEP CHANGE MERSON DIFFERENTIAL EQUATION SOLVER
 $DX/DT=F(X,T)$, $X(A)=X_0$

DBCEVU BICUBIC SPLINE MIXED PARTIAL DERIVATIVE EVALUATOR

DBCQDU COMPUTE AN APPROXIMATE DOUBLE INTEGRAL TO A GIVEN TABLE OF
DATA USING A NATURAL BICUBIC SPLINE INTERPOLANT

DCADRE INTEGRATE $F(X)$ FROM A TO B, USING CAUTIOUS ADAPTIVE ROMBERG
EXTRAPOLATION

DCSEVU EVALUATION OF FIRST AND SECOND DERIVATIVES OF A CUBIC SPLINE

DCSQDU INTEGRATE A CUBIC SPLINE BETWEEN LIMITS A AND B

DPEBS FIRST ORDER DIFFERENTIAL EQUATION SOLVER - THE METHOD OF
BULIRSCH - STOER FOR $DY/DT = F(Y,T)$

DVERK SOLUTION OF A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL
EQUATIONS OF THE FORM $DY/DX = F(X,Y)$ WITH INITIAL CONDITIONS
(A RUNGE-KUTTA METHOD BASED ON VERNER'S FIFTH AND SIXTH ORDER
PAIR OF FORMULAS IS USED)

DVCGER FIRST ORDER DIFFERENTIAL EQUATION SOLVER- GEAR'S METHOD FOR
 $DX/DT=F(X,T)$

EBALAC BALANCES A COMPLEX GENERAL MATRIX AND ISOLATES EIGENVALUES
WHENEVER POSSIBLE

EBALAF BALANCE A REAL MATRIX A

EBBCKG BACKTRANSFORM THE EIGENVECTORS OF A BALANCED COMPLEX GENERAL
MATRIX

EBECKF BACKTRANSFORM EIGENVECTORS OF A BALANCED MATRIX

EHBCKF BACKTRANSFORM THE EIGENVECTORS OF THE UPPER HESSENBERG MATRIX
FOUND IN EHESF

EHPCKH BACKTRANSFORM THE EIGENVECTORS OF A REAL SYMMETRIC
TRIDIAGONAL MATRIX OBTAINED FROM A HERMITIAN MATRIX

EHFSSC REDUCTION OF A COMPLEX MATRIX TO COMPLEX UPPER HESSENBERG
FORM

EHESSEF REDUCE A NONSYMMETRIC MATRIX TO UPPER HESSENBERG FORM BY ORTHOGONAL TRANSFORMATIONS

EHORKS PERFORM A BACK TRANSFORMATION TO FORM THE EIGENVECTORS OF THE ORIGINAL SYMMETRIC MATRIX FROM THE EIGENVECTORS OF THE TRIDIAGONAL MATRIX

EHOUH REDUCTION OF A COMPLEX HERMITIAN MATRIX TO A REAL SYMMETRIC TRIDIAGONAL MATRIX

EHOUSS REDUCE A SYMMETRIC MATRIX A TO SYMMETRIC TRIDIAGONAL FORM USING HOUSEHOLDER'S REDUCTION

EIGCC CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A COMPLEX GENERAL MATRIX

EIGCH CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A COMPLEX HERMITIAN MATRIX

EIGRF CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL GENERAL MATRIX

EIGRS CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL SYMMETRIC MATRIX

EIGZC CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A SYSTEM $A * X = \text{LAMBDA} * B * X$ WHERE A AND B ARE COMPLEX MATRICES OF ORDER N

EIGZF CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A SYSTEM $A * X = \text{LAMBDA} * B * X$ WHERE A AND B ARE REAL MATRICES OF ORDER N

FLRH1C COMPUTATION OF ALL EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX

FLRH2C COMPUTE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX AND BACK TRANSFORM THE EIGENVECTORS

ELXHC REDUCE TWO COMPLEX MATRICES, A AND B, SIMULTANEOUSLY, A TO UPPER HESSENBERG AND B TO UPPER TRIANGULAR FORM

ELZVC CALCULATE THE EIGENVALUES AND, OPTIONALLY, EIGENVECTORS OF THE SYSTEM $A * Z = \text{LAMBDA} * B * Z$ WHERE COMPLEX MATRIX A IS UPPER HESSENBERG AND COMPLEX MATRIX B IS UPPER TRIANGULAR

EQRH1F FIND THOSE EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES

EQPH3F FIND THE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX

EORT1S COMPUTE THE SMALLEST EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX USING THE QR ALGORITHM

EORT2S FIND THE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A TRIDIAGONAL MATRIX, T, USING THE QL METHOD

EQPT3S GIVEN A TRIDIAGONAL MATRIX T, FIND M AND LAMDA(I), I=1,...,M WHERE M IS THE SMALLEST INTEGER SUCH THAT $ABS(LAMDA(1)) + \dots + ABS(LAMDA(M))$ IS GREATER THAN OR EQUAL TO THE ABS(VALUE) AND LAMDA(1),...,LAMDA(M) ARE THE SMALLEST M EIGENVALUES OF T AND <VALUE> AS SPECIFIED BY THE USER

EQZGF REDUCE TWO MATRICES, A AND B, SIMULTANEOUSLY, A TO UPPER HESSENBERG AND B TO UPPER TRIANGULAR FORM

EQZTF OZ ITERATION - REDUCE AN UPPER HESSENBERG MATRIX A TO QUASI-UPPER TRIANGULAR FORM WHILE KEEPING MATRIX B TRIANGULAR

EQZVF CALCULATE THE EIGENVALUES AND, OPTIONALLY, EIGENVECTORS OF THE SYSTEM $A*Z=LAMDA*B*Z$ WHERE A IS QUASI-UPPER TRIANGULAR AND B IS UPPER TRIANGULAR

FECSIN COMPUTE THE SINE AND COSINE TRANSFORMS OF A SET OF REAL DATA

FFRDR2 THIS SUBROUTINE PERMUTES A COMPLEX DATA VECTOR IN REVERSE BINARY ORDER TO NORMAL ORDER. THE ROUTINE CAN ALSO BE USED TO PERMUTE A COMPLEX DATA VECTOR IN NORMAL ORDER TO REVERSE BINARY ORDER SINCE THE PERMUTATION IS SYMMETRIC.

FFTF COMPUTE THE FAST FOURIER TRANSFORM OF A DATA VECTOR

FFTR COMPUTE THE FAST FOURIER TRANSFORM OF A REAL DATA SEQUENCE

FFT2 COMPUTE THE FAST FOURIER TRANSFORM, GIVEN A COMPLEX VECTOR OF LENGTH EQUAL TO A POWER OF TWO

FFT2RV COMPUTE THE FAST FOURIER TRANSFORM, GIVEN A COMPLEX VECTOR OF LENGTH EQUAL TO A POWER OF TWO (DATA IN REVERSE BINARY ORDER)

FTARPS PRELIMINARY ESTIMATION OF THE AUTOREGRESSIVE PARAMETERS IN AN ARIMA STOCHASTIC MODEL

FTAUTO GIVEN A TIME SERIES COMPUTE 1. THE MEAN AND VARIANCE, 2. THE AUTOCOVARIANCES, 3. THE AUTOCOVARIANCES AND AUTOCORRELATIONS, 4. THE PARTIAL AUTOCORRELATIONS.

FTCAST USING A FITTED ARIMA STOCHASTIC MODEL, COMPUTE TIME SERIES FORECASTS AND PROBABILITY LIMITS FOR LEAD TIMES 1,2,3,...,LV(5)

FTCOMP NON-SEASONAL ARIMA STOCHASTIC MODEL ANALYSIS FOR A SINGLE TIME SERIES WITH FULL PARAMETER ITERATION AND MAXIMUM LIKELIHOOD ESTIMATION

FTCRCS GIVEN TWO MUTUALLY STATIONARY N CHANNEL TIME SERIES, COMPUTE A SELECTED SUBSET OF THE MEANS AND VARIANCES, CROSS-COVARIANCES, AND CROSS-CORRELATIONS

FTCRXY COMPUTE A SINGLE CROSS-COVARIANCE OF TWO MUTUALLY STATIONARY TIME SERIES

FTFFT1 FAST FOURIER TRANSFORM ESTIMATES OF POWER SPECTRA AND CROSS-SPECTRA OF TIME SERIES

FTFREQ SINGLE OR MULTICHANNEL TIME SERIES ANALYSIS IN THE TIME AND FREQUENCY DOMAINS

FTFUNC PROVIDE FUNCTIONAL COMMUNICATION BETWEEN FTMAPS AND ZSYSTEM (NOT A STAND-ALONE ROUTINE)

FTGEN1 GENERATE A TIME SERIES FOR A GIVEN ARIMA STOCHASTIC MODEL

FTKALM KALMAN FILTERING

FTMAPS PRELIMINARY ESTIMATION OF THE MOVING AVERAGE PARAMETERS IN AN ARIMA STOCHASTIC MODEL

FTMAXL MAXIMUM LIKELIHOOD ESTIMATION OF AUTOREGRESSIVE AND MOVING AVERAGE PARAMETERS IN AN ARIMA STOCHASTIC MODEL

FTPOIF TIME SERIES TRANSFORMATION AND DIFFERENCING

FTSIMP NON-SEASONAL ARIMA STOCHASTIC MODEL ANALYSIS FOR A SINGLE TIME SERIES

FTTRAN PRELIMINARY PARAMETER ESTIMATES FOR AN UNIVARIATE TRANSFER FUNCTION MODEL

FTWEIN SINGLE CHANNEL WEINER FORECAST

FTWENM COMPUTE THE LEAST SQUARES ESTIMATE OF MULTICHANNEL WEINER FILTER COEFFICIENTS

FTWENX MAXIMUM LIKELIHOOD PARAMETER ESTIMATES FOR A MULTI-CHANNEL, SINGLE OUTPUT TIME SERIES MODEL

GFIT CHI-SQUARED GOODNESS OF FIT TEST

GGAMA GENERATE GAMMA (A,1) PSEUDO-RANDOM DEVIATES. THIS CODE CAN ALSO BE USED TO GENERATE EXPONENTIAL, CHI-SQUARED, CHI, BETA, T, AND F DEVIATES.

GGRTN GENERATE ONE BINOMIAL PSEUDO RANDOM DEViate

GGPNB GENERATE NEGATIVE BINOMIAL PSEUDO-RANDOM DEVIATES

GGPTA GENERATE N DEVIATES DISTRIBUTED BETA(P,Q) (REJECTION METHOD)

GGCAU GENERATE CAUCHY PSEUDO-RANDOM DEVIATES

GGCAU GENERATE ONE CHI-SQUARED DEViate WITH N DEGREES OF FREEDOM

GGFOM GENERATE GEOMETRIC PSEUDO-RANDOM DEVIATES

GGEXP GENERATES EXPONENTIAL DEVIATES WITH MEAN XM AND STANDARD DEVIATION XM. THE DISTRIBUTION FUNCTION IS $P=1-\exp(-X/XM)$. WHERE X IS GREATER THAN OR EQUAL TO ZERO. THIS ROUTINE USES UNIFORM (0,1) DEVIATES IN VECTOR R, GENERATED BY GGUB, AND TRANSFORMS USING $-1 \times = P(Y)$.

GGHYP GENERATE HYPERGEOMETRIC PSEUDO-RANDOM DEVIATES

GGMUL GENERATE ONE MULTINOMIAL PSEUDO-RANDOM DEVIATE

GGNLN GENERATE LOG NORMAL PSEUDO-RANDOM DEVIATES

GGNMP GENERATE NORMAL DEVIATES BY THE POLAR METHOD

GGNOF GENERATE ONE NORMAL (0,1) PSEUDO RANDOM NUMBER BY INVERTING THE NORMAL PROBABILITY DISTRIBUTION. GGUB (CODED INTERNALLY) PROVIDES THE UNIFORM PSEUDO RANDOM DEVIATE.

GGNOR GENERATE PSEUDO-NORMAL RANDOM NUMBERS

GGNRM MULTIVARIATE NORMAL DEVIATE GENERATOR. ENTRY GGNRM SHOULD BE USED ON THE FIRST CALL TO FACTOR THE SIGMA MATRIX AND GENERATE DEVIATES.

GGNRM1 MULTIVARIATE NORMAL DEVIATE GENERATOR. ENTRY GGNRM1 SHOULD BE USED ON ALL BUT THE FIRST CALL, IF MULTIPLE CALLS ARE NECESSARY. (ENTRY IN GGNRM)

GGPOSH GENERATE POISSON RANDOM DEVIATES

GGPOSF GENERATE POISSON RANDOM DEVIATES

GGSPR SAMPLE UNIFORMLY FROM THE SURFACE OF THE UNIT THREE OR FOUR SPHERE

GGTMAJ GENERATE GAMMA RANDOM DEVIATES (REJECTION METHOD)

GGTMA1 GENERATE N GAMMA (A,B) DEVIATES (ENTRY GGTMA1 SHOULD BE USED ON THE FIRST CALL FOR A GIVEN A AND B)

GGTMA2 GENERATE N GAMMA (A,B) DEVIATES (ENTRY GGTMA2 SHOULD BE USED ON ALL BUT THE FIRST CALL IF MULTIPLE CALLS ARE NECESSARY FOR THE SAME A AND B) (ENTRY IN GGTMA1)

GGTRI GENERATE TRIANGULAR PSEUDO-RANDOM DEVIATES

GGUB BASIC UNIFORM (0,1) PSEUDO-RANDOM NUMBER GENERATOR

GGUBF BASIC UNIFORM (0,1) PSEUDO-RANDOM NUMBER GENERATOR (FUNCTION FORM OF ROUTINE GGUB). GGUBF(ISEED) PROVIDES THE SAME DEVIATE AS DOES GGUB(ISEED,1,R). REFER TO THE DOCUMENT FOR GGUB FOR MORE DETAILED INFORMATION.

GGU4 GENERATE SHUFFLED UNIFORM (0,1) PSEUDO-RANDOM DEVIATES

GGVACR GENERATE IOP(2) RANDOM DEVIATES FROM THE DISTRIBUTION OF ANY CONTINUOUS RANDOM VARIABLE HAVING A STRICTLY MONOTONE INCREASING DISTRIBUTION FUNCTION (DF)

GGWEI GENERATE WEIBULL PSEUDO-RANDOM DEVIATES

GTCN DETERMINATION OF SAMPLE SIZE OR NUMBER OF CLASS INTERVALS

GTDD D-SQUARE TALLY (ENTRY IN GTDD1)

GTDD1 SAME AS GTDD, BUT MUST BE USED IN THE FIRST OF A SERIES OF CALLS TO GTDD

GTDD2T D-SQUARE TEST

GTMN MOMENTS AND STANDARDIZED MOMENTS (ENTRY IN GTMN1)

GTMN1 SAME AS GTMN, BUT MUST BE REFERENCED IN THE FIRST OF A SERIES OF CALLS TO GTMN

GTNOR TEST FOR NORMALITY OF RANDOM DEVIATES

GTPBC COUNTS THE NUMBER OF ZERO BITS IN A GIVEN WORD R

GTPKP GENERATE A TABLE OF PROBABILITIES THAT, OF N ELEMENTS, EACH OF WHICH CAN TAKE ON TWO STATES, M ARE IN ONE STATE AND N-M ARE IN THE OTHER STATE. M RANGES THROUGH THE VALUES 0,1,...,K, WHERE $K=N-M$ IF N IS EVEN AND $N-M-1$ OTHERWISE. GTPKP IS USED TO PREPARE EXPECTED VALUES FOR THE POKER TEST.

GTPL POKER TEST TALLY OF HAND TYPES AND STATISTICS

GTPCK POKER TEST

GTPRT TALLY OF COORDINATES ($R(I)$, $R(I+1)$) OF RANDOM NUMBERS

GTPST PAIRS OF GOOD'S SERIAL TEST

GTRN RUNS TEST

GTRT TALLY OF NUMBER OF RUNS. IF THE SEQUENCE OF NUMBERS FITS INTO CORE ONLY THIS ENTRY IS USED. (ENTRY IN GTRTM)

GTRTM TALLY OF NUMBER OF RUNS. THIS ENTRY USED WITH GTRT IF SEQUENCE OF RANDOM NUMBERS DOES NOT FIT IN CORE.

GTSRT TALLY OF COORDINATES ($R(I)$, $R(I+L)$) OF RANDOM NUMBERS (ENTRY IN GTPRT)

GTTRT TALLY OF TRIPLETS

GTTT TRIPLETS TEST

IBCEVU EVALUATION OF A BICUBIC SPLINE

IBCICU BICUBIC SPLINE TWO-DIMENSIONAL COEFFICIENT CALCULATOR

IBCI EU	BICUBIC SPLINE TWO-DIMENSIONAL INTERPOLATOR
ICSEVU	EVALUATION OF A CUBIC SPLINE
ICSFKU	LEAST SQUARES APPROXIMATION BY CUBIC SPLINES - FIXED KNOTS
IGSICU	INTERPOLATORY APPROXIMATION BY CUBIC SPLINES WITH ARBITRARY SECOND DERIVATIVE END CONDITIONS
IGSMOU	ONE-DIMENSIONAL DATA SMOOTHING BY ERROR DETECTION
ICSSCU	CUBIC SPLINE DATA SMOOTHING
ICSVKU	LEAST SQUARES APPROXIMATION BY CUBIC SPLINES - VARIABLE KNOTS
IQHSCU	ONE-DIMENSIONAL QUASI-CUBIC HERMITE INTERPOLATION
IRATCU	RATIONAL WEIGHTED CHEBYSHEV APPROXIMATION OF A CONTINUOUS FUNCTION
LEGT1B	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - SPACE ECONOMIZER SOLUTION - BAND STORAGE MODE
LEGT1C	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - SPACE ECONOMIZER SOLUTION - COMPLEX MATRICES
LEGT1F	LINEAR EQUATION SOLUTION - FULL STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEGT1P	LINEAR EQUATION SOLUTION - SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEGT2B	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - HIGH ACCURACY SOLUTION - BAND STORAGE MODE
LEGT2C	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - HIGH ACCURACY SOLUTION - COMPLEX MATRICES
LEGT2F	LINEAR EQUATION SOLUTION - FULL STORAGE MODE - HIGH ACCURACY SOLUTION
LEGT2P	LINEAR EQUATIONS SOLUTION - SYMMETRIC STORAGE MODE - HIGH ACCURACY SOLUTION
LEG1FB	LINEAR EQUATION SOLVER - SYMMETRIC BAND STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEG1S	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - SPACE ECONOMIZER SOLUTION - SYMMETRIC STORAGE MODE - INDEFINITE MATRICES
LEQ2PB	LINEAR EQUATION SOLUTION - SYMMETRIC BAND STORAGE MODE - HIGH ACCURACY SOLUTION
LEQ2S	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - HIGH ACCURACY SOLUTION - SYMMETRIC STORAGE MODE - INDEFINITE MATRICES

LINV1F INVERSION OF A MATRIX - FULL STORAGE MODE - SPACE ECONOMIZER SOLUTION

LINV1P INVERSION OF A POSITIVE DEFINITE SYMMETRIC MATRIX - SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION

LINV2F INVERSION OF A MATRIX - FULL STORAGE MODE - HIGH ACCURACY SOLUTION

LINV2P INVERSION OF MATRIX - SYMMETRIC STORAGE MODE- HIGH ACCURACY SOLUTION

LINV3F MATRIX DECOMPOSITION, MATRIX INVERSION, LINEAR EQUATION SOLUTION, AND DETERMINANT EVALUATION

LINV3P IN-PLACE MATRIX INVERSION AND LINEAR EQUATION SOLUTION - POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE

LIN1PB INVERSION OF A MATRIX - SYMMETRIC BAND STORAGE MODE - SPACE ECONOMIZER SOLUTION

LIN2PB INVERSION OF A MATRIX - SYMMETRIC BAND STORAGE MODE - HIGH ACCURACY SOLUTION

LLSGAR LEAST SQUARES SOLUTION OF OVERDETERMINED SYSTEM OF LINEAR EQUATIONS

LPSDOR PSEUDO-INVERSE OF A MATRIX

LSVALR SINGULAR VALUE DECOMPOSITION OF A MATRIX

LUDAPB LU DECOMPOSITION OF A POSITIVE DEFINITE SYMMETRIC BAND MATRIX - CHOLESKY DECOMPOSITION

LUDATF LU DECOMPOSITION BY THE CROUT ALGORITHM WITH OPTIONAL ACCURACY TEST

LUDECP CHOLESKY DECOMPOSITION OF A MATRIX - SYMMETRIC STORAGE MODE

LUFLMF ELIMINATION PART OF SOLUTION OF $AX=B$ - FULL STORAGE MODE

LUELMP ELIMINATION PART OF THE SOLUTION OF $AX=B$ - SYMMETRIC STORAGE MODE

LUELPB ELIMINATION PORTION OF THE SOLUTION OF $AX = B$ SYMMETRIC BAND STORAGE MODE

LURFFC REFINEMENT OF SOLUTION TO LINEAR EQUATIONS - FULL STORAGE MODE

LUREFP REFINEMENT OF SOLUTION TO LINEAR EQUATIONS - SYMMETRIC STORAGE MODE

LUREPB REFINEMENT OF SOLUTION TO LINEAR EQUATIONS - SYMMETRIC BAND STORAGE MODE

MDPBTA INCOMPLETE BETA PROBABILITY DISTRIBUTION FUNCTION

MOBFTI	INVERSE INCOMPLETE BETA PROBABILITY DISTRIBUTION FUNCTION
MOBIN	BINOMIAL PROBABILITY DISTRIBUTION FUNCTION
MOBNOR	BIVARIATE NORMAL PROBABILITY DISTRIBUTION FUNCTION
MOCH	CHI-SQUARED PROBABILITY - NON-INTEGER DEGREES OF FREEDOM
MOCHI	INVERSE CHI-SQUARED PROBABILITY DISTRIBUTION FUNCTION
MOFD	F PROBABILITY DISTRIBUTION FUNCTION
MOFDRE	F PROBABILITY DISTRIBUTION FUNCTION
MOFI	INVERSE F PROBABILITY DISTRIBUTION FUNCTION
MOGAM	INCOMPLETE GAMMA PROBABILITY DISTRIBUTION FUNCTION
MOHYP	HYPERGEOMETRIC PROBABILITY DISTRIBUTION
MONOR	EVALUATE THE NORMAL (0,1) PROBABILITY DISTRIBUTION FUNCTION (ENTRY IN MERF)
MOPOS	CUMULATIVE PROBABILITY FROM THE POISSON DISTRIBUTION FUNCTION (ENTRY IN MOTPOS)
MOSMR	KOLMOGOROV-SMIRNOV STATISTICS ASYMPTOTIC DISTRIBUTION FUNCTION VALUES
MOSTI	INVERT A MODIFICATION OF THE STUDENTS T DISTRIBUTION
MOTD	STUDENT'S T DISTRIBUTION
MDTN	NON-CENTRAL T PROBABILITY DISTRIBUTION FUNCTION
MOTNF	INTEGRATE T(Y,Z) FOR NON-CENTRAL T USAGE
MOTPCS	CUMULATIVE AND INDIVIDUAL TERMS OF THE POISSON PROBABILITY DISTRIBUTION FUNCTION
MERF	COMPUTE THE ERROR FUNCTION
MERFC	COMPUTE THE COMPLEMENTED ERROR FUNCTION (ENTRY IN MERF)
MERFCI	COMPUTE THE INVERSE COMPLEMENTED ERROR FUNCTION (ENTRY IN MERFI)
MERFI	COMPUTE THE INVERSE ERROR FUNCTION
MGAMMA	GAMMA FUNCTION OF A REAL ARGUMENT X
MLGAMA	NATURAL LOG OF THE GAMMA FUNCTION OF A REAL ARGUMENT X (ENTRY IN MGAMMA)
MMBSIO	COMPUTE SINGLE PRECISION VALUES OF THE MODIFIED BESSEL FUNCTION OF THE FIRST KIND OF ORDER ZERO

MMBSI1 COMPUTE SINGLE PRECISION VALUES OF THE MODIFIED BESSEL
FUNCTION OF THE FIRST KIND OF ORDER ONE

MMBSJ0 COMPUTE SINGLE PRECISION VALUES OF THE BESSEL FUNCTION OF THE
FIRST KIND OF ORDER ZERO

MMBSJ1 COMPUTE SINGLE PRECISION VALUES OF THE BESSEL FUNCTION OF THE
FIRST KIND OF ORDER ONE

MMBSK0 COMPUTE SINGLE PRECISION VALUES OF THE MODIFIED BESSEL
FUNCTION OF THE SECOND KIND OF ORDER ZERO

MMBSK1 COMPUTE SINGLE PRECISION VALUES OF THE MODIFIED BESSEL
FUNCTION OF THE SECOND KIND OF ORDER ONE

MMBSYN COMPUTE SINGLE PRECISION VALUES OF THE BESSEL FUNCTION OF THE
SECOND KIND OF NON-NEGATIVE REAL FRACTIONAL ORDER FOR REAL
POSITIVE ARGUMENTS

MMDAW COMPUTES SINGLE PRECISION VALUES OF DAWSON'S INTEGRAL

MMDEI COMPUTE SINGLE PRECISION VALUES OF THE EXPONENTIAL INTEGRALS

MMDELE COMPUTE SINGLE PRECISION VALUES OF THE COMPLETE ELLIPTIC
INTEGRALS OF THE SECOND KIND

MMDELK COMPUTE SINGLE PRECISION VALUES OF THE COMPLETE ELLIPTIC
INTEGRALS OF THE FIRST KIND

MMKEL0 EVALUATE THE DERIVATIVES OF THE KELVIN FUNCTIONS (BER,BEI,KER
AND KEI) OF ORDER ZERO

MMKEL0 EVALUATE THE KELVIN FUNCTIONS BER, BEI, KER AND KEI OF ORDER
ZERO

MMKEL1 EVALUATE THE KELVIN FUNCTIONS BER, BEI, KER AND KEI OF ORDER
ONE

MMDNIS COMPUTE THE INVERSE GAUSSIAN INTEGRAL

MSMRAT COMPUTE $Z(X)/Q(X)$, THE RATIO OF THE ORDINATE TO THE UPPER
TAIL AREA OF THE STANDARDIZED NORMAL DISTRIBUTION, AT X

NAK1 KRUSKAL-WALLIS TEST FOR IDENTICAL POPULATIONS

NAWNRP WILSON ANALYSIS OF VARIANCE - NO REPLICATION

NAWRPE WILSON ANALYSIS OF VARIANCE - EQUAL REPLICATION

NAWRPU WILSON ANALYSIS OF VARIANCE - UNEQUAL REPLICATION

NBCYC NOETHER'S TEST FOR CYCLICAL TREND

NBQT PERFORM THE COCHRAN Q TEST

NBSD COX AND STUART'S SIGN TEST FOR TRENDS IN DISPERSION

NBSL COX AND STUART'S SIGN TEST FOR TRENDS IN LOCATION (ENTRY IN NBSO)

NBSIGN SIGN TEST

NOMPLE ESTIMATE THE PROBABILITY DENSITY FUNCTION (PDF) WHICH GAVE RISE TO A RANDOM SAMPLE ACCORDING TO A DISCRETE NONPARAMETRIC MAXIMUM PENALIZED LIKELIHOOD CRITERION

NDXEST EVALUATE THE PROBABILITY ESTIMATE FROM IMSL ROUTINE NOMPLE AT A POINT Y

NHEXT FISHER'S EXACT METHOD FOR 2 BY 2 MATRICES

NHINC INCLUDANCE TEST

NKS1 KOLMOGOROV-SMIRNOV ONE-SAMPLE TEST

NKS2 KOLMOGOROV-SMIRNOV TWO-SAMPLE TEST

NMCC CALCULATE AND TEST THE SIGNIFICANCE OF THE KENDALL COEFFICIENT OF CONCORDANCE

NMKEN KENDALL'S TEST FOR CORRELATION

NMKSE GIVEN K, THE SCORE FROM THE KENDALL RANK CORRELATION COEFFICIENT CALCULATIONS (SEE NMKEN), AND N, THE SAMPLE SIZE, CALCULATE THE FREQUENCY DISTRIBUTION OF K AND THE PROBABILITY OF EQUALLING OR EXCEEDING THE GIVEN K

NMKST JONCKHEERE'S K-SAMPLE TRENDS TEST AGAINST ORDERED ALTERNATIVES

NMRANK NUMERICAL RANKING

NMTIE GIVEN A MONOTONICALLY ORDERED SET OF OBSERVATIONS, DETERMINE TIES AND CERTAIN STATISTICS RELATED TO THE TIES. IN THE OUTPUT DESCRIPTION BELOW, T REFERS TO THE NUMBER OF OBSERVATIONS TIED FOR A GIVEN RANK, AND THE SUM IS OVER ALL RANKS.

NRPHA BHAPKAR V TEST

NRWMP WILCOXON'S SIGNED RANK TEST. IF THE DIFFERENCE, X-Y, HAS ALREADY BEEN COMPUTED INTO X, CALL NRWMPD.

NRWRST WILCOXON'S RANK-SUM TEST

OCLINK PERFORM A SINGLE-LINKAGE OR COMPLETE-LINKAGE HIERARCHICAL CLUSTER ANALYSIS GIVEN A SIMILARITY MATRIX

OFCCF COMPUTE A MATRIX OF FACTOR SCORE COEFFICIENTS FOR INPUT TO IMSL ROUTINE OFSCOR

OFCCM COMPUTE AN UNROTATED FACTOR LOADING MATRIX ACCORDING TO A COMMON FACTOR MODEL BY UNWEIGHTED OR GENERALIZED LEAST SQUARES, OR BY MAXIMUM LIKELIHOOD PROCEDURES

OFHARR TRANSFORMATION OF UNROTATED FACTOR LOADING MATRIX TO OBLIQUE AXES BY HARRIS-KAISER METHOD

OFIMAG COMPUTE AN UNROTATED FACTOR LOADING MATRIX ACCORDING TO AN IMAGE MODEL

OFIMAZ LEAST SQUARES SOLUTION TO THE MATRIX EQUATION $AT = B$

OFPRIN COMPUTE AN UNROTATED FACTOR LOADING MATRIX ACCORDING TO A PRINCIPAL COMPONENT MODEL

OFPROT OBLIQUE TRANSFORMATION OF THE FACTOR LOADING MATRIX USING A TARGET MATRIX, INCLUDING PIVOT AND POWER VECTOR OPTIONS

OFRESI COMMUNALITIES AND NORMALIZED FACTOR RESIDUAL CORRELATION MATRIX CALCULATION

OFROTA ORTHOGONAL ROTATION OF A FACTOR LOADING MATRIX USING A GENERALIZED ORTHOMAX CRITERION, INCLUDING QUARTIMAX, VARIMAX, AND EQUAMAX

OFSCHN ORTHOGONAL TRANSFORMATION OF THE FACTOR LOADING MATRIX USING A TARGET MATRIX

OFSCOR COMPUTE A SET OF FACTOR SCORES GIVEN THE FACTOR SCORE COEFFICIENT MATRIX

OIND WILK'S TEST FOR THE INDEPENDENCE OF K SETS OF MULTI-NORMAL VARIATES

OPPING OBTAIN THE PRINCIPAL COMPONENTS OF AN M VARIATE SAMPLE OF OBSERVATIONS

OTMLNR MAXIMUM LIKELIHOOD ESTIMATION FROM GROUPED AND CENSORED NORMAL DATA

PLGOMP GENERATE THE INDEPENDENT VARIABLE SETTINGS FOR AN ORTHOGONAL CENTRAL COMPOSITE DESIGN, GIVEN THE MINIMUM AND MAXIMUM VALUE FOR EACH VARIABLE

PLDQOM DECODE A QUADRATIC REGRESSION MODEL

RLDQVA COMPUTE VARIANCES OF DECODED ORTHOGONAL POLYNOMIAL REGRESSION COEFFICIENTS

RLDQW VARIANCES OF CODED ORTHOGONAL POLYNOMIAL REGRESSION COEFFICIENTS FOR USAGE ONLY IN CONJUNCTION WITH IMSL ROUTINES RLFOH AND RLFOH, AND PROVIDED TO PREPARE INPUT FOR IMSL ROUTINE RLDQVA

RLDQPM DECODE AN ORTHOGONAL POLYNOMIAL REGRESSION MODEL

PLEAP USING A LEAPS AND BOUNDS ALGORITHM, DETERMINE A NUMBER OF BEST REGRESSION SUBSETS OF A FULL REGRESSION MODEL

RLFITI PURE REPLICATION ERROR DEGREES OF FREEDOM AND SUM OF SQUARES - IN CORE VERSION

RLFIT0 PURE REPLICATION ERROR DEGREES OF FREEDOM AND SUM OF SQUARES
- OUT OF CORE VERSION

RLFCR ORTHOGONAL POLYNOMIAL REGRESSION ANALYSIS - EASY TO USE
VERSION

RLFORC SELECT REGRESSION MODEL USING FORWARD STEPWISE ALGORITHM
(FORCING VARIABLES INTO THE MODEL) (ENTRY IN RLSTEP)

RLFOTH ORTHOGONAL POLYNOMIAL REGRESSION - FORSYTHE

RLFOTW WEIGHTED ORTHOGONAL POLYNOMIAL REGRESSION (FORSYTHE)

RLGGMI CENTER INDEPENDENT VARIABLE SETTINGS AND GENERATE CENTERED
SQUARE AND CROSS PRODUCT TERMS - IN CORE VERSION

RLGQMO CENTER INDEPENDENT VARIABLE SETTINGS AND GENERATE UNCENTERED
SQUARE AND CROSS PRODUCT TERMS - OUT OF CORE VERSION

PLINCF ONE OR TWO-SIDED RESPONSE CONTROL USING A FITTED SIMPLE
LINEAR REGRESSION MODEL

RLINFF POINT AND INTERVAL INVERSE PREDICTION USING A FITTED SIMPLE
LINEAR REGRESSION MODEL

RLMUL MULTIPLE LINEAR REGRESSION ANALYSIS

RLONE ANALYSIS OF A SIMPLE LINEAR REGRESSION MODEL

RLOPDC PREDICT RESPONSE USING ORTHOGONAL POLYNOMIAL REGRESSION MODEL

RLPOLY GENERATE ORTHOGONAL POLYNOMIALS

RLPOL1 GENERATE ORTHOGONAL POLYNOMIALS WITH THE ASSOCIATED CONSTANTS
AA AND BB (ENTRY IN RLPOLY)

PLPRDI CALCULATE $100(1-\text{ALPHA})$ PER CENT CONFIDENCE INTERVALS FOR THE
TRUE RESPONSE AND FOR THE AVERAGE OF NR FUTURE OBSERVATIONS
ON THE RESPONSE AT A SET OF N POINTS IN THE DESIGN SPACE - IN
CORE VERSION

RLPRDO CALCULATE $100(1-\text{ALPHA})$ PER CENT CONFIDENCE INTERVALS FOR THE
TRUE RESPONSE, AND FOR THE AVERAGE OF NR FUTURE OBSERVATIONS
ON THE RESPONSE, AT A POINT IN THE DESIGN SPACE - OUT OF CORE
VERSION

RLRES PERFORM A RESIDUAL ANALYSIS FOR A FITTED REGRESSION MODEL
ALLOWING, OPTIONALLY, A MODEL BASED ON A SUBSET OF THE
ORIGINAL DATA MATRIX

RLSEP SELECTION OF A REGRESSION MODEL USING A FORWARD STEPWISE
ALGORITHM AND COMPUTATION OF THE USUAL ANALYSIS OF VARIANCE
TABLE ENTRIES - EASY TO USE VERSION

RLSTEP SELECT REGRESSION MODEL USING FORWARD STEPWISE ALGORITHM

RLSUBM RETRIEVE A SYMMETRIC SUBMATRIX FROM A MATRIX STORED IN SYMMETRIC STORAGE MODE. RLSUBM MAY BE USED IN CONJUNCTION WITH RLSTEP.

RLSUM REORDER ROWS AND CORRESPONDING COLUMNS OF A SYMMETRIC MATRIX STORED IN SYMMETRIC STORAGE MODE

RSMTZ FIT THE NON-LINEAR REGRESSION MODEL $Y(I) = \text{ALPHA} + \text{BETA} * \text{GAMMA} ** X(I) + E(I)$

RSMSSE COMPUTE THE ERROR SUM OF SQUARES FOR THE MODEL $Y(I) = \text{ALPHA} + \text{BETA} * \text{GAMMA} ** X(I) + E(I)$ FOR GIVEN VALUES OF THE PARAMETERS, ALPHA, BETA, AND GAMMA

SSPAND SIMPLE RANDOM SAMPLING WITH PROPORTION DATA-INFERENCES REGARDING THE POPULATION PROPORTION AND TOTAL

SSPBLK STRATIFIED RANDOM SAMPLING WITH PROPORTION DATA - INFERENCES REGARDING THE POPULATION PROPORTION AND TOTAL

SSPAND FOR THE CASE OF SIMPLE RANDOM SAMPLING WITH CONTINUOUS DATA, MAKE INFERENCES REGARDING THE POPULATION MEAN AND TOTAL USING RATIO OR REGRESSION ESTIMATION

SSRBLK STRATIFIED RANDOM SAMPLING WITH CONTINUOUS DATA-INFERENCES REGARDING THE POPULATION MEAN AND TOTAL USING RATIO OR REGRESSION ESTIMATION

SSSAND FOR THE CASE OF SIMPLE RANDOM SAMPLING WITH CONTINUOUS DATA MAKE INFERENCES REGARDING THE POPULATION MEAN AND TOTAL

SSSBLK STRATIFIED RANDOM SAMPLING WITH CONTINUOUS DATA - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL

SSSCAN SINGLE STAGE CLUSTER SAMPLING WITH CONTINUOUS DATA - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL

SSSEST TWO-STAGE SAMPLING WITH CONTINUOUS DATA AND EQUISIZED PRIMARY UNITS - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL

UERTST ERROR MESSAGE GENERATION

USCPOM READ A MATRIX - OPTIONAL SEQUENCE CHECK

USHIST PRINT A HISTOGRAM

USHIUT PRINT A HISTOGRAM, ALLOWING PRINTING OF TWO FREQUENCIES USING ONE HISTOGRAM BAR

USHV1 PRINT A HISTOGRAM (HORIZONTAL)

USLEAP PRINT RESULTS OF THE BEST REGRESSIONS ANALYSIS PERFORMED BY IMSL ROUTINE PLEAP

USNMVX LOCATES THE MINIMUM AND MAXIMUM VALUES OF A VECTOR

USPC	PRINT SAMPLE PDF, THEORETICAL PDF AND CONFIDENCE BAND INFORMATION (PLOT THESE ON OPTION)
USPDF	PLOTS TWO SAMPLE PROBABILITY DISTRIBUTION FUNCTIONS AGAINST THEIR SPECTRA
USPLH	PROVIDES A PRINTER PLOT OF UP TO TEN FUNCTIONS
USPDM	READ A MATRIX
USROV	READ A VECTOR
USPDVM	READ A VECTOR CONTAINING MISSING VALUE CODES
USTREE	PRINT A BINARY TREE (WHICH MAY REPRESENT THE RESULTS OF A HIERARCHICAL CLUSTERING ALGORITHM)
USWB	PRINT A MATRIX WITH OR WITHOUT USER-SUPPLIED COLUMN LABELS - BAND STORAGE MODE
USWBSM	PRINT A MATRIX WITH OR WITHOUT USER-SUPPLIED LABELS - BAND SYMMETRIC STORAGE MODE
USWLFM	PRINT A MATRIX WITH USER-SUPPLIED COLUMN LABELS - FULL STORAGE MODE
USWLSM	PRINT A MATRIX WITH USER-SUPPLIED LABELS - SYMMETRIC STORAGE MODE
USWTFM	PRINT A MATRIX - FULL STORAGE MODE
USWTFV	PRINT A VECTOR
USWTSM	PRINT A MATRIX - SYMMETRIC STORAGE MODE
USWTSV	PRINT ROW OR COLUMN OF A MATRIX - SYMMETRIC STORAGE MODE
VABMXF	FIND THE MAXIMUM ABSOLUTE VALUE OF THE ELEMENTS OF A VECTOR OR A SUBSET OF THE ELEMENTS OF A VECTOR
VAPMXS	FIND THE MAXIMUM ABSOLUTE VALUE OF THE ELEMENTS OF A ROW (OR COLUMN) OF A MATRIX STORED IN SYMMETRIC STORAGE MODE
VABSME	SUM THE ABSOLUTE VALUES OF THE ELEMENTS OF A VECTOR OR A SUBSET OF A VECTOR
VABSMS	SUM THE ABSOLUTE VALUES OF THE ELEMENTS OF A ROW (OR COLUMN) OF A MATRIX STORED IN SYMMETRIC STORAGE MODE
VCONVO	PERFORM THE CONVOLUTION OF TWO INPUT SEQUENCES OF DATA USING THE FAST FOURIER TRANSFORM
VCVTEF	STORAGE MODE CONVERSION - BAND TO FULL
VCVTCH	STORAGE MODE CONVERSION OF MATRICES - FULL COMPLEX TO HERMITIAN

VCVTFB STORAGE MODE CONVERSION - FULL TO BAND

VCVTFQ STORAGE MODE CONVERSION - FULL TO BAND SYMMETRIC

VCVTFS STORAGE MODE CONVERSION OF MATRICES - FULL TO SYMMETRIC

VCVTHC STORAGE MODE CONVERSION OF MATRICES - HERMITIAN TO FULL COMPLEX

VCVTGF STORAGE MODE CONVERSION - BAND SYMMETRIC TO FULL STORAGE MODE

VCVTGS STORAGE MODE CONVERSION - BAND SYMMETRIC TO SYMMETRIC

VCVTSE STORAGE MODE CONVERSION OF MATRICES - SYMMETRIC TO FULL

VCVTSQ STORAGE MODE CONVERSION - SYMMETRIC TO BAND SYMMETRIC

VDCPS DECOMPOSE AN INTEGER INTO ITS PRIME FACTORS

VHSH2C HOUSEHOLDER TRANSFORMATION - ZERO A SINGLE COMPLEX ELEMENT OF A MATRIX A

VHSH2R HOUSEHOLDER TRANSFORMATION - ZERO A SINGLE ELEMENT OF A MATRIX A

VHSH3R HOUSEHOLDER TRANSFORMATION - ZERO TWO ELEMENTS OF A MATRIX A

VIFRFF VECTOR INNER PRODUCT OF TWO VECTORS OR SUBSETS OF TWO VECTORS

VIPRSS VECTOR INNER PRODUCT OF TWO VECTORS EACH OF WHICH IS PART OF SOME MATRIX STORED IN SYMMETRIC MODE

VMULBB MATRIX MULTIPLICATION - BAND STORAGE MODE

VMULBF MULTIPLICATION OF A MATRIX STORED IN BAND STORAGE MODE AND A MATRIX STORED IN FULL STORAGE MODE

VMULBS MULTIPLICATION OF A BAND MATRIX STORED IN BAND STORAGE MODE AND A SYMMETRIC MATRIX STORED IN SYMMETRIC STORAGE MODE

VMULFB MULTIPLICATION OF A FULL MATRIX BY A BAND MATRIX STORED IN BAND STORAGE MODE

VMULFF MATRIX MULTIPLICATION - FULL STORAGE MODE

VMULFM MATRIX MULTIPLICATION OF THE TRANSPOSE OF MATRIX A BY MATRIX B - FULL STORAGE MODE

VMULFP MATRIX MULTIPLICATION OF MATRIX A BY THE TRANSPOSE OF MATRIX B - FULL STORAGE MODE

VMULFQ MULTIPLICATION OF A MATRIX STORED IN FULL STORAGE MODE AND A BAND SYMMETRIC MATRIX STORED IN BAND SYMMETRIC STORAGE MODE

VMULFS FULL MATRIX BY SYMMETRIC MATRIX MULTIPLICATION

VMULCB MULTIPLICATION OF A BAND SYMMETRIC MATRIX STORED IN BAND SYMMETRIC STORAGE MODE BY A BAND MATRIX STORED IN BAND STORAGE MODE

VMULQF MULTIPLICATION OF A BAND SYMMETRIC MATRIX STORED IN BAND SYMMETRIC STORAGE MODE BY A FULL MATRIX STORED IN FULL STORAGE MODE

VMULGQ MULTIPLICATION OF TWO MATRICES STORED IN BAND SYMMETRIC STORAGE MODE

VMULGS MULTIPLICATION OF A MATRIX STORED IN BAND SYMMETRIC STORAGE MODE BY A MATRIX STORED IN SYMMETRIC STORAGE MODE

VMULSB MULTIPLICATION OF A SYMMETRIC MATRIX STORED IN SYMMETRIC STORAGE MODE BY A BAND MATRIX STORED IN BAND STORAGE MODE

VMULSF MULTIPLICATION OF A MATRIX STORED IN SYMMETRIC STORAGE MODE BY A FULL MATRIX

VMULSQ MULTIPLICATION OF A MATRIX STORED IN SYMMETRIC STORAGE MODE BY A MATRIX STORED IN BAND SYMMETRIC STORAGE MODE

VMULSS MATRIX MULTIPLICATION-SYMMETRIC STORAGE MODE

VNRMF1 INFINITY-NORM OF A MATRIX - FULL STORAGE MODE

VNRMF1 1-NORM OF A MATRIX - FULL STORAGE MODE

VNRMF2 EUCLIDEAN NORM OF A MATRIX - FULL STORAGE MODE

VNRMS1 1-NORM OF A MATRIX - SYMMETRIC STORAGE MODE

VNRMS2 EUCLIDEAN NORM OF A MATRIX - SYMMETRIC STORAGE MODE

VPOLYF MATRIX POLYNOMIAL EVALUATION - FULL STORAGE MODE

VSORTA SORT ARRAYS BY ALGEBRAIC VALUE (ENTRY IN VSORTM)

VSORTM SORT ARRAYS BY ABSOLUTE VALUE

VSORTP SORT ARRAYS BY ALGEBRAIC VALUE - PERMUTATIONS RETURNED (ENTRY IN VSRTPM)

VSORTZ INTERCHANGE THE ROWS OR COLUMNS OF A MATRIX USING A PERMUTATION VECTOR SUCH AS ONE OBTAINED FROM IMSL ROUTINES VSORTP OR VSRTPM

VSRTPM SORT ARRAYS BY ABSOLUTE VALUE - PERMUTATIONS RETURNED

VTPROF TRANSPOSE PRODUCT OF MATRIX - FULL STORAGE MODE

VTPROS TRANSPOSE PRODUCT OF MATRIX - SYMMETRIC STORAGE MODE

VTPAN TRANSPOSE A RECTANGULAR MATRIX IN PLACE

VUABQ ADDITION OF A BAND MATRIX STORED IN BAND STORAGE MODE AND A BAND SYMMETRIC MATRIX STORED IN BAND SYMMETRIC STORAGE MODE (MATRIX SUBTRACTION MAY BE DONE VIA THIS ROUTINE IF THE USER (PRIOR TO ENTRY) MANIPULATES THE SIGNS OF THE MATRICES TO GIVE THE DESIRED RESULT)

VUAFB ADDITION OF A MATRIX STORED IN FULL STORAGE MODE AND A MATRIX STORED IN BAND STORAGE MODE (MATRIX SUBTRACTION MAY BE DONE VIA THIS ROUTINE IF THE USER (PRIOR TO ENTRY) MANIPULATES THE SIGNS OF THE MATRICES TO GIVE THE DESIRED RESULT)

VUAFO ADDITION OF A MATRIX STORED IN FULL STORAGE MODE AND A BAND SYMMETRIC MATRIX STORED IN BAND SYMMETRIC STORAGE MODE (MATRIX SUBTRACTION MAY BE DONE VIA THIS ROUTINE IF THE USER (PRIOR TO ENTRY) MANIPULATES THE SIGNS OF THE MATRICES TO GIVE THE DESIRED RESULT)

VUAFS ADDITION OF A MATRIX STORED IN FULL STORAGE MODE TO A MATRIX STORED IN SYMMETRIC STORAGE MODE (MATRIX SUBTRACTION MAY BE DONE VIA THIS ROUTINE IF THE USER (PRIOR TO ENTRY) MANIPULATES THE SIGNS OF THE MATRICES TO GIVE THE DESIRED RESULT)

VUASB ADDITION OF A MATRIX STORED IN SYMMETRIC STORAGE MODE AND A BAND MATRIX STORED IN BAND STORAGE MODE (MATRIX SUBTRACTION MAY BE DONE VIA THIS ROUTINE IF THE USER (PRIOR TO ENTRY) MANIPULATES THE SIGNS OF THE MATRICES TO GIVE THE DESIRED RESULT)

VUASQ ADDITION OF A SYMMETRIC MATRIX STORED IN SYMMETRIC STORAGE MODE TO A SYMMETRIC BAND MATRIX STORED IN SYMMETRIC BAND STORAGE MODE (MATRIX SUBTRACTION MAY BE DONE VIA THIS ROUTINE IF THE USER (PRIOR TO ENTRY) MANIPULATES THE SIGNS OF THE MATRICES TO GIVE THE DESIRED RESULT)

ZANLYT DETERMINATION OF ZEROS OF AN ANALYTIC COMPLEX FUNCTION USING MULLER'S METHOD WITH DEFLATION

ZBRENT TO FIND A ZERO OF A FUNCTION WHICH CHANGES SIGN IN A GIVEN INTERVAL

ZCPOLY ZEROS OF A POLYNOMIAL WITH COMPLEX COEFFICIENTS (JENKINS-TRAUB)

ZFALSE APPROXIMATE SOLUTION TO $F(X)=0$

ZPOLR ZEROS OF A POLYNOMIAL WITH REAL COEFFICIENTS (LAGUERRE)

ZQADC FIND THE ROOTS OF THE QUADRATIC EQUATION $A*Z**2+B*Z+C = 0.0$, WHERE THE COEFFICIENTS A, B, AND C ARE COMPLEX NUMBERS

ZQADR FIND THE ROOTS OF THE QUADRATIC EQUATION $A*Z**2+B*Z+C = 0.0$, WHERE THE COEFFICIENTS A, B, AND C ARE REAL NUMBERS

ZREAL1 ZREAL1 FINDS THE REAL ZEROS OF A REAL FUNCTION -- USED WHEN
INITIAL GUESSES ARE POOR

ZREAL2 ZREAL2 FINDS THE REAL ZEROS OF A REAL FUNCTION -- USED WHEN
INITIAL GUESSES ARE GOOD

ZPPOLY ZEROS OF A POLYNOMIAL WITH REAL COEFFICIENTS (JENKINS-TRAUB)

ZSRCH GENERATE K POINTS IN AN N DIMENSIONAL RECTANGLE

ZSYSTEM DETERMINATION OF A ROOT OF A SYSTEM OF N SIMULTANEOUS
NONLINEAR EQUATIONS IN N UNKNOWN, $F(X)=0$, IN VECTOR FORM (N
CAN BE 1)

ZXFIB MINIMIZE A UNIMODAL FUNCTION OF ONE INDEPENDENT VARIABLE,
WHERE A KNOWN FINITE INTERVAL CONTAINS THE MINIMUM, USING THE
FIBONACCI TECHNIQUE

ZXMIN A QUASI-NEWTON ALGORITHM FOR FINDING THE MINIMUM OF A
FUNCTION OF N VARIABLES

ZXSSG A MODIFIED LEVENBERG-MARQUARDT ALGORITHM FOR FINDING THE
MINIMUM OF THE SUM OF SQUARES OF M FUNCTIONS OF N VARIABLES

ZX1LP MAXIMIZE A LINEAR FUNCTION SUBJECT TO A SET OF LINEAR
CONSTRAINTS (ZX1LP IS DESIGNED TO HANDLE THE PHASE ONE
LINEAR PROGRAMMING PROBLEM AND ZX2LP IS DESIGNED TO HANDLE
THE PHASE TWO LINEAR PROGRAMMING PROBLEM)

ZX2LP SEE ZX1LP

ZX3LP SOLVE THE LINEAR PROGRAMMING PROBLEM $\max CT \cdot X$ SUBJECT TO $A \cdot X$
LESS THAN OR EQUAL TO B, AND X GREATER THAN OR EQUAL TO 0
WHERE CT EQUALS C-TRANSPOSE

MSL (PROPRIETARY)

THE CDC MATH SCIENCE LIBRARY CONTAINS OVER 300 NUMERICAL MATHEMATICAL ROUTINES COVERING THE FOLLOWING EIGHT AREAS:

- .PROGRAMMED ARITHMETIC
- .ELEMENTARY FUNCTIONS
- .POLYNOMIALS AND SPECIAL FUNCTIONS
- .ORDINARY DIFFERENTIAL EQUATIONS
- .INTERPOLATION, APPROXIMATION AND QUADRATURE
- .LINEAR ALGEBRA
- .PROBABILITY, STATISTICS AND TIME SERIES
- .NONLINEAR EQUATION SOLVERS

REFERENCE: MATH SCIENCE LIBRARY, VOLUMES 1-8, CDC PUBLICATION NUMBER 60327500.

ROUTINES IN LIBRARY 'MSL' INCLUDE:

ACFI	SINGLE CONTINUED FRACTION INTERPOLATION ON TABULAR DATA WITH ARBITRARY SPACING
ADR	ADD COEFFICIENTS OF LIKE POWERS OF TWO REAL POLYNOMIALS
AITKEN	AITKEN'S INTERPOLATION OF ORDER N-1 (ORDER RANGE FROM 1-9)
AMCON	PROVIDE CERTAIN MACHINE AND MATHEMATICAL CONSTANTS AS SINGLE PRECISION NUMBERS OF MAXIMUM ACCURACY
ATSM	SELECT A SUBTABLE ORDERED, ACCORDING TO PROXIMITY, OF THOSE POINTS THAT HAVE ABSCISSAE CLOSEST TO A GIVEN VALUE, FROM A MONOTONE ORDERED TABLE
BALANC	BALANCE A COMPLEX MATRIX BY THE USE OF DIAGONAL SIMILARITY TRANSFORMATIONS
BANFIG	DETERMINE A SPECIFIED NUMBER OF THE SMALLEST EIGENVALUES AND ASSOCIATED EIGENVECTORS OF THE ALGEBRAIC EIGENVALUE PROBLEM $A*VI=LAMBDA*B*VI$ WHERE A IS A SYMMETRIC, NONNEGATIVE DEFINITE, NARROW BAND MATRIX AND B IS A POSITIVE DEFINITE DIAGONAL MATRIX
BCHSDC	DECOMPOSE A REAL, SYMMETRIC POSITIVE BAND MATRIX INTO (BANDED) UPPER AND LOWER TRIANGULAR FACTORS
BOCWNP	DECOMPOSE A BANDED MATRIX INTO BANDED LOWER AND UPPER TRIANGULAR FACTORS WITH NO PIVOTING
BDECOM	DECOMPOSE A BANDED MATRIX B INTO BANDED LOWER AND UPPER TRIANGULAR FACTORS L AND U, WITH IMPLICIT EQUILIBRATION AND PARTIAL PIVOTING
BESNTS	EVALUATE A TABLE FOR THE BESSEL FUNCTION $I(X)$ FOR $N=0,1,2,3,\dots,J-1$
BESNKS	EVALUATE A TABLE OF VALUES OF THE BESSEL FUNCTION $K(X)$

BETAR COMPUTE INCOMPLETE BETA RATIO (OF THE INCOMPLETE BETA FUNCTION AT X,P,Q TO THE COMPLETE BETA FUNCTION AT P,Q)

BFBANP SOLVE $LY=B$ AND $UX=Y$ BY BACK SUBSTITUTIONS - WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND, L AND U ARE LOWER AND UPPER TRIANGULAR FACTORS, POSSIBLY OBTAINED FROM BDCWNP

BFBSUM SOLVE $LY=B$ AND $UX=Y$ BY BACK SUBSTITUTIONS - WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND, L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM BDECOM

BITERM SOLVE A SYSTEM OF LINEAR EQUATIONS WITH ITERATIVE REFINEMENT FOR SYSTEMS HAVING A BAND COEFFICIENT MATRIX

BITRFM SOLVE, WITH ITERATIVE REFINEMENT, A SYSTEM OF LINEAR EQUATIONS HAVING A BAND COEFFICIENT MATRIX

BITRNP SOLVE, WITH ITERATIVE REFINEMENT, A SYSTEM OF LINEAR EQUATIONS HAVING A BAND COEFFICIENT MATRIX

BITRPD SOLVE A SYSTEM OF LINEAR EQUATIONS WITH ITERATIVE REFINEMENT, GIVEN THE TRIANGULAR DECOMPOSITION

BITWNP SOLVE, WITH ITERATIVE REFINEMENT, A SYSTEM OF LINEAR EQUATIONS HAVING A BAND COEFFICIENT MATRIX

BLOCKDQ SOLVE A SYSTEM OF FIRST ORDER DIFFERENTIAL EQUATIONS AT A POINT B, GIVEN THE (INITIAL) VALUES AT A POINT A

BLESOM SOLVE A SYSTEM OF N LINEAR EQUATIONS (WITH M RIGHT-HAND SIDES), HAVING A BAND COEFFICIENT MATRIX

BLSWNP SOLVE A SYSTEM OF LINEAR EQUATIONS (WITH SEVERAL RIGHT-HAND SIDES), HAVING A BAND COEFFICIENT MATRIX, USING NO PIVOTING

BPDITH SOLVE A SYSTEM OF LINEAR EQUATIONS WITH ITERATIVE REFINEMENT - A BANDED, SYMMETRIC SYSTEM WITH POSITIVE DEFINITENESS

BPDSEB SOLVE $LY=B$ AND $LTX=Y$ BY BACK SUBSTITUTIONS - WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND L AND LT ARE THE LOWER TRIANGULAR FACTOR AND ITS TRANSPOSE POSSIBLY OBTAINED FROM BCHSDG

BPDSON SOLVE A POSITIVE DEFINITE SYMMETRIC BAND SYSTEM OF EQUATIONS HAVING M RIGHT-HAND SIDES

BRTLTT COMPUTE THE TEST STATISTIC FOR BARTLETT'S TEST OF HOMOGENEITY OF A GROUP OF VARIANCE ESTIMATES AND DETERMINE THE PROBABILITY OF OBTAINING A VALUE FOR THE TEST STATISTIC LESS THAN THAT OBSERVED

BSJ EVALUATE THE SPHERICAL BESSEL FUNCTION $J(X)$ FOR $N=-1,0,\dots,I$

BSUPHT FIND A LEAST SQUARES SOLUTION TO AN OVERDETERMINED SYSTEM THAT HAS BEEN DECOMPOSED USING HOUSEHOLDER TRANSFORMATIONS

BVP SOLVE NONLINEAR P-POINT BOUNDARY VALUE PROBLEM IN ORDINARY DIFFERENTIAL EQUATIONS

CADR ADD COEFFICIENTS OF LIKE POWERS OF TWO COMPLEX POLYNOMIALS

CBAREX EVALUATE $C \cdot R$ FOR C A COMPLEX NUMBER AND R A REAL NUMBER

CCOMPE EVALUATE A POLYNOMIAL HAVING COMPLEX COEFFICIENTS AT A COMPLEX POINT

CCONGR SOLVE THE RECTANGULAR SYSTEM $AX\text{-}BAR=B\text{-}BAR$ IN THE LEAST SQUARES SENSE, IF NO EXACT SOLUTION EXISTS - A, B-BAR, X-BAR ARE COMPLEX

COECOM DECOMPOSE A COMPLEX SQUARE MATRIX INTO POWER AND UPPER TRIANGULAR MATRICES WITH PARTIAL PIVOTING AND ROW EQUILIBRATION

COERIV GIVEN THE COMPLEX COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE COMPLEX COEFFICIENTS OF THE DERIVATIVE POLYNOMIAL

CEL3 COMPUTE THE COMPLETE ELLIPTIC INTEGRAL OF THE THIRD KIND

CFBSUM SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS WITH COMPLEX ELEMENTS, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM COECOM

CFOME CONSTRUCT THE MINIMAX POLYNOMIAL THROUGH A DISCRETE, WEIGHTED, SET OF POINTS

CGITRF SOLVE A COMPLEX SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDE COMPLEX COLUMN VECTORS WITH ITERATIVE REFINEMENT

CGLESM SOLVE A COMPLEX SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES

CHEBAP FIND A CLOSE APPROXIMATION TO A MINIMAX FIT OF A GIVEN FUNCTION OVER A GIVEN INTERVAL

CHEBEV EVALUATE A CHEBYCHEV POLYNOMIAL AT A GIVEN POINT

CHIOST PERFORM THE CHI-SQUARE DISTRIBUTION TEST

CHIPRB COMPUTE THE PROBABILITY OF OBTAINING A VALUE OF CHI-SQUARE WHICH IS LESS THAN OR EQUAL TO THE GIVEN VALUE CHI-SQUARE

CHIRAB PERFORM A CHI-SQUARE TEST FOR RUNS ABOVE AND BELOW ZERO - TESTS HYPOTHESIS THAT A SAMPLE OF RANDOM VARIABLES IS OBTAINED FROM A POPULATION WHICH IS SYMMETRICALLY DISTRIBUTED ABOUT ZERO

CHIRUD PERFORM THE CHI-SQUARE TEST FOR RUNS UP AND DOWN

CHSDEC DECOMPOSE A POSITIVE DEFINITE SYMMETRIC MATRIX INTO A LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE

CHSGC FUNCTION TO COMPUTE THE VALUE OF CHI-SQUARE WHEN GIVEN THE EXPECTED AND OBSERVED FREQUENCIES

CHTOL EVALUATE THE DISTANCE OF A POINT TO A LINE

CINPRO COMPUTE THE INNER PRODUCT OF TWO VECTORS HAVING COMPLEX COEFFICIENTS IN DOUBLE PRECISION

CINT GIVEN THE COMPLEX COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE COEFFICIENTS OF THE INTEGRAL POLYNOMIAL

CITERF SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH ITERATIVE REFINEMENT, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS HAVING COMPLEX ELEMENTS, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM CDECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

CLOIV DIVIDE A POLYNOMIAL WITH COMPLEX COEFFICIENTS BY THE LINEAR EXPRESSION $(X+B)$ WHERE B IS COMPLEX

CHPYR FIND THE PRODUCT OF TWO POLYNOMIALS WHEN ANY OF THE COEFFICIENTS ARE COMPLEX

CNSLVL ESTIMATE THE ERROR PERFORMED IN THE EVALUATION OF A COMPLEX POLYNOMIAL IN THE NEIGHBORHOOD OF ONE OF ITS ROOTS

COMBES COMPUTE A TABLE OF BESSEL FUNCTIONS OF THE FIRST AND SECOND KINDS FOR COMPLEX ARGUMENT AND ORDERS

CONCUR FIND THE SLOPES AT A GIVEN SET OF POINTS OF THE CUBIC SPLINE PASSING THROUGH THE POINTS

COMPEV EVALUATE A REAL POLYNOMIAL AT A COMPLEX POINT

CONRAY PERFORM ARITHMETIC OPERATIONS ON THE OBSERVATIONS OF ONE VARIABLE IN A MULTIPLEXED DATA ARRAY AND A SPECIFIED CONSTANT

CORCCV COMPUTE EITHER THE AUTOCORRELATION COEFFICIENTS OR THE AUTOVARIANCE COEFFICIENTS FOR ONE OF THE VARIABLES IN A MULTIPLEXED DATA ARRAY

COSEVL EVALUATE A COSINE POLYNOMIAL AT A GIVEN POINT

CPDIV PROVIDE THE QUOTIENT AND REMAINDER OBTAINED BY DIVIDING ONE POLYNOMIAL BY ANOTHER - COEFFICIENTS MAY BE COMPLEX

CPOLRT FIND ALL ROOTS OF AN NTH DEGREE POLYNOMIAL HAVING COMPLEX COEFFICIENTS

CPTRAN COORDINATE TRANSLATION SUCH THAT THE POLYNOMIAL $P(X)$ BECOMES $P(X+T) - P(X)$ MAY HAVE COMPLEX COEFFICIENTS.

CODIV DIVIDE THE COMPLEX POLYNOMIAL BY THE QUADRATIC EXPRESSION (X^2+3X+C) , B AND C COMPLEX

CRFV REVERSE THE ORDER OF POLYNOMIAL COEFFICIENTS IN AN ARRAY - COEFFICIENTS MAY BE COMPLEX

CSBR SUBTRACT COEFFICIENTS OF LIKE POWERS OF TWO POLYNOMIALS - COEFFICIENTS MAY BE COMPLEX

CSHRNK COMPUTE THE COEFFICIENTS OF THE POLYNOMIAL $P(AX)$ FROM THE COEFFICIENTS OF THE POLYNOMIAL $P(X)$ - COMPLEX COEFFICIENTS

CUBIC2 FIT A CUBIC TO TWO POINTS, GIVEN THE SLOPE AT EACH

CURV EVALUATE THE MERIT FUNCTION FOR A GIVEN DATA SET

DCBHT REDUCE A GIVEN MATRIX TO UPPER TRIANGULAR FORM BY HOUSEHOLDER TRANSFORMATIONS

DCWNE DECOMPOSE A SQUARE MATRIX INTO LOWER AND UPPER TRIANGULAR MATRICES WITH PARTIAL PIVOTING BUT WITHOUT ROW EQUILIBRATION

DCWNP DECOMPOSE A SQUARE MATRIX INTO LOWER AND UPPER TRIANGULAR MATRICES WITHOUT PIVOTING

DECOM DECOMPOSE A SQUARE MATRIX INTO LOWER AND UPPER TRIANGULAR MATRICES WITH PARTIAL PIVOTING AND ROW EQUILIBRATION

DEIG SOLVE FOR THE EIGENVALUES AND RIGHT EIGENVECTORS OF THE DYNAMICAL SYSTEM $AX+BX+CX=0$ WHERE A, B, C ARE REAL, BUT OTHERWISE GENERAL, MATRICES

DERIV GIVEN THE REAL COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE REAL COEFFICIENTS OF THE DERIVATIVE POLYNOMIAL

DETERM CALCULATE THE DETERMINANT OF A SQUARE MATRIX IN THE FORM $D1*(2**D2)$ USING THE INFORMATION FROM THE SUBROUTINE DECOM

DIFTAB DIFFERENTIATE NUMERICALLY A FUNCTION GIVEN AS A TABLE WITH EQUISPACED ARGUMENTS

DLETE REMOVE SPECIFIED OBSERVATIONS FROM A DATA ARRAY

DRATEX SOLVE NUMERICALLY INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS

DSRPT COMPUTE MEANS, STANDARD DEVIATIONS, VARIANCES, AND COEFFICIENTS OF SKEWNESS AND KURTOSIS FOR MULTIPLEXED DATA ARRAYS

DSRPT2 DETERMINE THE MEDIAN, MINIMUM, MAXIMUM AND RANGE FOR EITHER A SINGLE VARIABLE IN A MULTIPLEXED DATA ARRAY OR ALL THE VARIABLES IN A MULTIPLEXED DATA ARRAY

DTSHFT FURNISH A GUESS OF AN EIGENVALUE TO A COMPLEX HESSENBERG MATRIX

EIGCHK GIVEN AN APPROXIMATE EIGENVALUE/EIGENVECTOR PAIR OF A REAL SYMMETRIC MATRIX A, AND THE MATRIX, AND ESTIMATES OF THE CLOSEST EIGENVALUES TO THE GIVEN EIGENVALUE, PROVIDE ERROR BOUNDS AND POSSIBLY REFINEMENT OF THE EIGENVALUE

FIGC01 GIVEN AN APPROXIMATION TO AN EIGENVALUE OF A REAL MATRIX HAVING REAL AND DISTINCT ROOTS, CONVERGE TO THE EIGENVALUE-EIGENVECTOR PAIR WHOSE EIGENVALUE IS NEAREST TO THIS APPROXIMATION

FIGIMP REFINE THE EIGENVECTORS OBTAINED FROM SUBROUTINE EIGVCH (WIFLANOT INVERSE ITERATION)

FIGSYM FIND ALL EIGENVECTORS OF A REAL, SYMMETRIC MATRIX - SUBSET OF EIGENVECTORS MAY ALSO BE FOUND

EIGVCH COMPUTE THE EIGENVECTORS CORRESPONDING TO A REAL EIGENVALUE OF A REAL UPPER HESSENBERG MATRIX

EIG5 FIND ALL, OR OPTIONALLY A SUBSET OF THE EIGENVALUES OF A GENERAL, REAL-ELEMENTED MATRIX

ELF EVALUATE THE INCOMPLETE ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND

ELK EVALUATE THE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND

EL3 COMPUTE THE ELLIPTIC INTEGRAL OF THE THIRD KIND

ERF COMPUTE THE ERROR FUNCTION

ERFINV FIND THE INVERSE ERROR FUNCTION - COMPUTE THE UPPER LIMIT OF THE INTEGRAL IN THE ERROR FUNCTION

EVREAL EVALUATE A POLYNOMIAL HAVING REAL COEFFICIENTS AT A REAL VALUE OF THE INDEPENDENT VARIABLE

EXRAND GENERATE RANDOM NUMBERS HAVING A NEGATIVE EXPONENTIAL DISTRIBUTION

FABSV COMPUTE THE VALUE OF THE MODULUS OF A VECTOR

FAFRAC ADD TWO FRACTIONS AND EXPRESS THE RESULT AS A FRACTION IN ITS LOWEST FORM

FBSUBM SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS, AND U AND L ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM

FBSUBS SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS, WHERE B IS A COLUMN VECTOR, AND U AND L ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM

FGGM2 SOLVE THE RECTANGULAR EQUATION SYSTEM $AX-\bar{B}=B-\bar{B}$ IN THE LEAST SQUARES SENSE, IF NO EXACT SOLUTION EXISTS - A, X-BAR, B-BAR ARE COMPLEX

FCLSQ CONSTRUCT A LEAST SQUARE POLYNOMIAL OF A SPECIFIED DEGREE
 WHOSE GRAPH APPROXIMATES A SET OF DATA POINTS

FDLSQ CONSTRUCT A LEAST SQUARE POLYNOMIAL APPROXIMATION OF SOME
 PRE-ASSIGNED DEGREE TO A SET OF DATA POINTS WITH GIVEN WEIGHT
 WHERE THE POLYNOMIAL IS CONSTRAINED AT N POINTS AND THE
 DERIVATIVE IS ALSO CONSTRAINED AT THE FIRST M OF THE N POINTS
 WHERE $M \leq N$

FFRAC CHANGE A VECTOR WITH FRACTIONAL COMPONENTS INTO ONE WITH
 INTEGER COMPONENTS TIMES A SCALAR FRACTION

FHRNEW CONSTRUCT THE HERMETIAN POLYNOMIAL OF DEGREE $N+M+1$ THROUGH
 $N+1$ COORDINATES WITH DERIVATIVES AT THE FIRST $M+1$ POINTS

FILTER COMPUTE THE OUTPUTS FROM A MOVING AVERAGE -- AUTOGRESSIVE
 FILTER - BOTH INPUT AND OUTPUT ARRAYS MAY BE MULTIPLEXED
 ARRAYS

FITLIN FIND THE BEST FIT LINE - MINIMIZE THE SUM OF THE SQUARES OF
 THE PEPENDICULAR DISTANCES FROM THE POINTS TO THE LINE

FLGNEW CONSTRUCT THE NTH DEGREE LAGRANGIAN THROUGH $N+1$ COORDINATES
 $X(I)$, $AF(I)$

FLSCFY FIND A LEAST SQUARES POLYNOMIAL OF SPECIFIED DEGREE WHOSE
 GRAPH APPROXIMATES A SET OF DATA POINTS

FMFRAC MULTIPLY TWO FRACTIONS AND EXPRESS THE RESULT AS A FRACTION
 IN ITS LOWEST TERMS

FMMX MATRIX-MATRIX MULTIPLICATION

FMTMX MULTIPLY THE TRANSPOSE OF A MATRIX BY A MATRIX ON THE RIGHT

FMTR TRANSPOSE AN M BY N MATRIX

FMTVCX MULTIPLY THE TRANSPOSE OF A COMPLEX MATRIX ON THE RIGHT BY A
 COMPLEX VECTOR

FMTVX MULTIPLY THE TRANSPOSE OF A MATRIX BY A VECTOR

FMULT1 MULTIPLY A GIVEN NTH DEGREE POLYNOMIAL BY A GIVEN LINEAR
 FACTOR TO GIVE AN $(N+1)$ TH DEGREE POLYNOMIAL

FMVCX MULTIPLY A COMPLEX MATRIX ON THE RIGHT BY A COMPLEX VECTOR

FMTVX MATRIX-VECTOR MULTIPLICATION

FNORM1 NORMALIZE A VECTOR

FOURAP FIND THE LEAST SQUARES APPROXIMATING TRIGONOMETRIC POLYNOMIAL
 TO A SET OF GIVEN DATA HAVING EQUISPACED ABSCISSAE

FOURI FIND AN INTERPOLATING TRIGONOMETRIC POLYNOMIAL TO A SET OF DATA HAVING EQUISPACED ABSCISSAE

FPUR SUBTRACT FROM A VECTOR ITS COMPONENT ALONG ANOTHER VECTOR

GAMAIN COMPUTE THE INCOMPLETE GAMMA FUNCTION

GAMMA EVALUATE THE GAMMA FUNCTION OF A REAL ARGUMENT X

GITRFM SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES WITH ITERATIVE REFINEMENT

GITRFS SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH ITERATIVE REFINEMENT

GLESCM SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES

GLESCS SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE

GMI EVALUATE NUMERICALLY A SINGLE, DOUBLE OR M-TUPLE (M.LE.10) INTEGRAL OF AN ARBITRARY INTEGRAND BETWEEN ARBITRARY LIMITS

HANKEL EVALUATE THE COMPLEX-VALUED HANKEL FUNCTION OF THE FIRST OR SECOND KIND FOR REAL ARGUMENT AND INTEGER ORDER

HARM COMPUTE A FINITE DISCRETE COMPLEX FOURIER TRANSFORM OF A ONE-, TWO- OR THREE-DIMENSIONAL ARRAY OF COMPLEX FOURIER AMPLITUDES

HCF FIND THE HIGHEST COMMON FACTOR OF TWO INTEGERS

HFLP CALCULATE THE ROOTS OF A POLYNOMIAL HAVING COMPLEX COEFFICIENTS

HERMIT EVALUATE THE INTEGRAL OF $E^{*}(-X^{*2})F(X)DX$ FROM NEGATIVE TO POSITIVE INFINITY WITH $F(X)$ A REAL FUNCTION OF ONE VARIABLE

HRMT1 PERFORM INTERPOLATION, GIVEN A VALUE OF THE INDEPENDENT VARIABLE AND A TABLE OF CORRESPONDING VALUES OF THE INDEPENDENT AND DEPENDENT VARIABLE AND ITS DERIVATIVE - EXTRAPOLATION IS ALLOWED

HRMT2 PERFORM HERMITE INTERPOLATIONS, GIVEN AN ARRAY OF VALUES OF THE INDEPENDENT VARIABLE, AND A TABLE OF CORRESPONDING VALUES OF THE INDEPENDENT AND THE DEPENDENT VARIABLE AND ITS DERIVATIVE

HSSN REDUCE A GENERAL REAL MATRIX TO AN UPPER HESSENBERG FORM BY A SIMILARITY TRANSFORMATION AND PROVIDE THE ELEMENTS IF THE TRANSFORMATION MATRIX

HSTGRM DETERMINE THE NUMBER OF OBSERVATIONS OF A RANDOM VARIABLE WHICH LIE IN USER SPECIFIED INTERVALS - USED FOR DISTRIBUTION TESTS AND FOR PLOTTING HISTOGRAMS

INRPRD COMPUTE THE INNER PRODUCT OF TWO VECTORS

INT GIVEN THE REAL COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE COEFFICIENTS OF THE INTEGRAL POLYNOMIAL

INVERS FIND THE INVERSE OF A SQUARE MATRIX USING DECOM AND FBSUBM

INVITR FIND THE INVERSE OF A SQUARE MATRIX WITH ITERATIVE REFINEMENT

IRAND GENERATE RANDOM INTEGERS BETWEEN TWO GIVEN VALUES - EACH OF THE INTEGERS BETWEEN THE GIVEN LIMITS HAS AN EQUAL PROBABILITY OF OCCURRING

ITERFM SOLVE $LY=B$ AND $LX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN INTERVATIVE REFINEMENT, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITERFS SOLVE $LY=B$ AND $LX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN INTERVATIVE REFINEMENT, WHERE B IS A COLUMN VECTOR, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITERIN PERFORM THE ITERATIVE REFINEMENT FOR THE INVERSE OF A SQUARE MATRIX

ITRLSQ PERFORM THE ITERATIVE REFINEMENT OF A LEAST SQUARES SOLUTION OBTAINED FROM THE SUBROUTINE BSBHT

ITPPDM SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN ITERATIVE REFINEMENT FOR A POSITIVE DEFINITE SYSTEM $AX=B$ (B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND L AND U ARE THE LOWER TRIANGLE MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITPPDS SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN ITERATIVE REFINEMENT FOR A POSITIVE DEFINITE SYSTEM $AX=B$ (B IS A COLUMN VECTOR AND L AND U ARE THE LOWER TRIANGLE MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITRSPM SOLVE $LY=B$ AND $DLTX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH ITERATIVE REFINEMENT (WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS, AND L AND LT ARE A LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, D IS A DIAGONAL MATRIX, OBTAINED FROM SPDCOM) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITRSPS SOLVE $LY=B$ AND $DLTX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS WITH ITERATIVE REFINEMENT (WHERE B IS A COLUMN VECTOR, AND L AND LT ARE A LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, D IS A DIAGONAL MATRIX, OBTAINED FROM SPDCOM) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

LAGCIF DIFFERENTIATE NUMERICALLY A TABULAR FUNCTION, AT ANY POINT

LAGINT PERFORM LAGRANGIAN INTERPOLATION AT A GIVEN ABSCISSA

LAGRAN EVALUATE THE INTEGRAL OF A REAL FUNCTION OF ONE VARIABLE, GIVEN THE ARRAYS OF THE INDEPENDENT AND THE DEPENDENT VARIABLES

LAGUER EVALUATE THE INTEGRAL OF $F(X)DX$ FROM A TO E^{*-X} WITH $F(X)$ A REAL FUNCTION OF ONE VARIABLE AND E^{*-X} THE WEIGHTING FN

LATNTR FIND THE EIGENVALUES (REAL AND COMPLEX) OF A REAL MATRIX

LCM FIND THE LEAST COMMON MULTIPLE OF TWO INTEGERS

LDIV DIVIDE A POLYNOMIAL WITH REAL COEFFICIENTS BY THE LINEAR EXPRESSION $(X+B)$ - B IS REAL

LEGEN EVALUATE THE INTEGRAL OF A REAL FUNCTION OF ONE VARIABLE OVER A FINITE INTERVAL, WHEN THE FUNCTION GENERATOR IS GIVEN

LESHNE SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH PARTIAL PIVOTING BUT WITHOUT ROW EQUILIBRATION - PROVIDE DATA FOR CALCULATING THE DETERMINANT

LESWNP SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITHOUT PIVOTING

LINPVP SOLVE NUMERICALLY LINEAR P-POINT BOUNDARY POINT PROBLEMS IN N FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS

LINSYS SOLVE GENERAL SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS - PROVIDE THE DATA TO EVALUATE READILY THE DETERMINANT OF THE COEFFICIENT MATRIX

LITWNE SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH ITERATIVE REFINEMENT, WITH PARTIAL PIVOTING, WITHOUT ROW EQUILIBRATION - PROVIDE THE DATA FOR CALCULATING THE DETERMINANT AND THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX

LITWNP SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH ITERATIVE REFINEMENT AND WITHOUT PIVOTING

LOGGAM COMPUTE THE NATURAL LOGARITHM OF THE GAMMA FUNCTION FOR COMPLEX ARGUMENT

LSCHTM SOLVE LINEAR LEAST SQUARES PROBLEMS FOR AN OVERDETERMINED SYSTEM WITH K RIGHT-HAND SIDES BY HOUSEHOLDER TRANSFORMATIONS

LSCHTS SOLVE LINEAR LEAST SQUARES PROBLEMS FOR AN OVERDETERMINED SYSTEM WITH ONE RIGHT-HAND SIDE BY HOUSEHOLDER TRANSFORMATIONS

LSQSIT SOLVE LINEAR LEAST SQUARES PROBLEMS BY HOUSEHOLDER TRANSFORMATION, USING ITERATIVE REFINEMENT

MIGEN FIND A MINIMAX FUNCTION APPROXIMATION TO A SET OF POINTS IN TERMS OF A LINEAR COMBINATION OF A PRESCRIBED SET OF FUNCTIONS

MILN2 SMOOTH A SET OF DATA BY AN AVERAGING PROCESS

MINRAT FIND A MINIMAX RATIONAL FUNCTION APPROXIMATION OF GIVEN DEGREE TO A SET OF POINTS

MPYR FIND THE PRODUCT OF TWO POLYNOMIALS WHEN THE COEFFICIENTS ARE ALL REAL

MULLP FIND ALL ZEROS OR A SINGLE ZERO OF A POLYNOMIAL HAVING COMPLEX COEFFICIENTS

NBESJ COMPUTE BESSEL FUNCTIONS OF FIRST KIND FOR REAL ARGUMENT AND INTEGER ORDERS

NEWT SOLVE A SYSTEM OF NON-LINEAR EQUATIONS

NONLIQ SOLVE A SYSTEM OF NON-LINEAR ALGEBRAIC EQUATIONS

NRAND GENERATE PSEUDO-RANDOM NUMBERS WHICH ARE NORMALLY DISTRIBUTED AND STORE VALUES IN A MULTIPLEXED ARRAY

NRICH ENRICH A SET OF POINTS BY ADDING POINTS ON AN INTERPOLATING CURVE THROUGH THE GIVEN POINTS

NRKVS SOLVE A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AT A POINT B WITH INITIAL VALUES GIVEN AT A POINT A

NRKVSH SOLVE A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AT A POINT B WITH INITIAL VALUES GIVEN AT A POINT A

NRML GENERATE PSEUDO-RANDOM NUMBERS HAVING A NORMAL DISTRIBUTION

NRMNO GENERATE NORMALLY DISTRIBUTED PSEUDO-RANDOM NUMBERS WITH A CONVENIENT WAY OF HANDLING THE TAIL OF THE DISTRIBUTION - STORE THOSE NUMBERS IN A MULTIPLEXED DATA ARRAY

NRS6 SOLVE M BY N SYSTEM OF NON-LINEAR EQUATIONS

NSLVL ESTIMATE THE ERROR PERFORMED IN THE EVALUATION OF A REAL POLYNOMIAL AT A COMPLEX POINT IN THE NEIGHBORHOOD OF ONE OF ITS ROOTS

OP1PAY PERFORM ONE OF NINE POSSIBLE TRANSFORMATIONS ON THE OBSERVATIONS OF A SINGLE VARIABLE IN A MULTIPLEXED DATA ARRAY

OP2RAY PERFORM AN ARITHMETIC OPERATION (+, -, *, /, **) ON THE CORRESPONDING OBSERVATIONS OF TWO VARIABLES STORED IN MULTIPLEXED DATA ARRAYS

ORTHFT FIT A GIVEN SET OF POINTS WITH A LINEAR COMBINATION OF PRESCRIBED GENERAL FUNCTIONS OF LINEARLY INDEPENDENT VARIABLE(S)

ORTHON GIVEN A SET OF N LINEARLY INDEPENDENT REAL VECTORS OF DIMENSION M, CONSTRUCT A SET WHICH SPANS THE SAME SUBSPACE AND WHOSE VECTORS ARE ORTHONORMAL WITH RESPECT TO A DEFINED INNER PRODUCT

PAGE APPROXIMATE FUNCTIONS WHICH HAVE MACLAURIN SERIES EXPANSIONS BY RATIONAL FUNCTIONS USING PAGE APPROXIMATIONS

PARBL EVALUATE THE INTEGRAL OF A BOUNDED REAL FUNCTION OF ONE REAL VARIABLE OVER A FINITE INTERVAL

PARFAC RESOLVE A RATIONAL FUNCTION INTO PARTIAL FRACTIONS

PBETA COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A BETA DISTRIBUTION

PBINOM COMPUTE THE CUMULATIVE PROBABILITY FOR THE BINOMIAL DISTRIBUTION

PCHY COMPUTE THE CUMULATIVE PROBABILITY FOR THE CAUCHY DISTRIBUTION

PDITRM SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS $AX=B$ HAVING M RIGHT-HAND SIDES

PDITRS SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS $AX=B$ HAVING ONE RIGHT-HAND SIDE

PDIV PROVIDE THE QUOTIENT AND REMAINDER OBTAINED BY DIVIDING ONE POLYNOMIAL BY ANOTHER - COEFFICIENTS ARE REAL

PDLSCM SOLVE A POSITIVE DEFINITE SYSTEM $AX=B$ HAVING M RIGHT-HAND SIDES USING THE CHOLESKY DECOMPOSITION

PDL SOS SOLVE A POSITIVE DEFINITE SYSTEM $AX=B$ HAVING ONE RIGHT-HAND SIDE USING THE CHOLESKY DECOMPOSITION

PDSFEM SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM $AX=B$ - B IS A MATRIX OF M COLUMN VECTORS AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC

PDSFBS SOLVE $LY=B$ AND $UX=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM $AX=B$ - B IS A COLUMN VECTOR AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC

PEDIST COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM AN F - (VARIANCE-RATIO) DISTRIBUTION

PGEOM COMPUTE THE CUMULATIVE PROBABILITY FOR THE GEOMETRIC DISTRIBUTION

PGMMA COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A GAMMA DISTRIBUTION

PHYPGE COMPUTE THE CUMULATIVE PROBABILITY FOR THE HYPERGEOMETRIC DISTRIBUTION

PIBETA DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A BETA DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIBIN DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A BINOMIAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PICHI DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A CHI-SQUARE DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PICHY DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A CAUCHY DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIEXP DETERMINE THE VALUE OF AN EXPONENTIALLY DISTRIBUTED RANDOM VARIABLE WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIFBIS DETERMINE THE VALUE OF A RANDOM VARIABLE FROM AN F DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIGAMA DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A GAMMA DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIGEO DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A GEOMETRIC DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIHYPG DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A HYPERGEOMETRIC DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PTLGNM DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A LOG-NORMAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PINBIN DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A NEGATIVE BINOMIAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PINCRM DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A NORMAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIPOIS DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A POISSON DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIPAYL DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A RAYLEIGH DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIT DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A STUDENT'S T DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PITRNM DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A TRUNCATED NORMAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIUNF DETERMINE THE VALUE OF A UNIFORMLY DISTRIBUTED, RANDOM VARIABLE WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIUNFD DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A UNIFORM DISCRETE DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIWEBL DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A WEIBULL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PLAGR FORMS AND READS, AT A GIVEN STATION X, THE POLYNOMIAL PASSING THROUGH ALL OF A GIVEN SET OF POINTS

PLGNRM COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A LOG-NORMAL DISTRIBUTION

PNBIN COMPUTE THE CUMULATIVE PROBABILITY FOR THE NEGATIVE BINOMIAL DISTRIBUTION

PNORM COMPUTE THE CUMULATIVE PROBABILITY FOR A NORMAL DISTRIBUTION

PORAND GENERATE RANDOM INTEGERS HAVING THE POISSON DISTRIBUTION

PRAYL COMPUTE THE CUMULATIVE PROBABILITY FOR THE RAYLEIGH DISTRIBUTION

PRBEXP DETERMINE THE PROBABILITY OF OBTAINING A VARIABLE HAVING VALUE = x_0 FROM A POPULATION HAVING AN EXPONENTIAL DISTRIBUTION

PRBUNF DETERMINE THE PROBABILITY OF OBTAINING A VARIABLE HAVING VALUE = x_0 FROM A POPULATION HAVING A UNIFORM DISTRIBUTION

PRDSUM COMPUTE THE INNER PRODUCT OF TWO VECTORS AND ADD IT TO AN INCOMING VALUE C

PRICH ENRICH A GIVEN ARRAY WHICH DEFINES A CURVE BY INSERTING POINTS SO AS TO OPTIMIZE THE MERIT FUNCTION DEFINED IN CURV

PPONY CONSTRUCT AN APPROXIMATION WHICH IS THE SUM OF A PRESCRIBED NUMBER OF EXPONENTIALS TO A SET OF N DATA POINTS

PROCT FIND ALL REAL AND COMPLEX ROOTS OF A POLYNOMIAL WITH REAL COEFFICIENTS BY THE METHOD OF BAIRSTOW-NEWTON

PTDIST COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A T- (STUDENT'S) DISTRIBUTION

PTRAN COORDINATE TRANSLATION SUCH THAT POLYNOMIAL $P(X)$ BECOMES $P(X+T) - P(X)$ HAS REAL COEFFICIENTS

PTPRM COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A TRUNCATED NORMAL DISTRIBUTION IN THE RANGE BETWEEN A AND B

PUNFD COMPUTE THE CUMULATIVE PROBABILITY FOR THE DISCRETE UNIFORM DISTRIBUTION

PWEBL COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A WEIBULL DISTRIBUTION

QDIV DIVIDE A REAL POLYNOMIAL BY THE QUADRATIC EXPRESSION $(X^2+B*X+C)$, B AND C REAL

QNWT SOLVE SYSTEMS OF NON-LINEAR ALGEBRAIC OF TRANSCENDENTAL EQUATIONS

QREIG FIND ALL EIGENVALUES OF A COMPLEX MATRIX

QR1 PERFORM A SINGLE, COMPLEX QR-ITERATION ON A MATRIX IN UPPER HESSENBERG FORM, HAVING REAL SUBDIAGONAL ELEMENTS

QUAD PERFORM NUMERICAL QUADRATURE ON BOTH WELL-BEHAVED AND POORLY-BEHAVED FUNCTIONS

RAND GENERATE UNIFORMLY DISTRIBUTED OR NORMALLY DISTRIBUTED RANDOM NUMBERS

RATL COMPUTE THE COEFFICIENTS OF THE LEAST SQUARES APPROXIMATION TO A SET OF DISCRETE DATA BY A RATIONAL FUNCTION

RAYLGH COMPUTE THE RAYLEIGH QUOTIENT FOR REAL SYMMETRIC MATRICES

RBESY COMPUTE BESSEL FUNCTION OF SECOND KIND FOR POSITIVE REAL ARGUMENT AND INTEGER ORDERS

RECOV1 RECOVER EIGENVECTORS AFTER A REDUCTION USING A TRIANGULAR MATRIX IN THE SIMILARITY TRANSFORMATION

RECOV2 RECOVER EIGENVECTORS OF THE EIGENPROBLEMS $BA = \lambda B A$ OR $YB = \lambda B A Y$, WHERE A, B ARE REAL, SYMMETRIC AND B IS POSITIVE DEFINITE

REDSYS1 REDUCE THE EIGENPROBLEM $(A - \lambda B)X = 0$ TO A STANDARD SYMMETRIC PROBLEM $(P - \lambda B)Z = 0$ - A MUST BE REAL SYMMETRIC, B MUST BE REAL SYMMETRIC POSITIVE DEFINITE TO ALLOW THE DECOMPOSITION $B = LL^T$

REDSYS2 REDUCE TO STANDARD FORM THE EIGENPROBLEMS $(AB - \lambda B A I)X = 0$ OR $(BA - \lambda B A I)Y = 0$, WHERE A, B ARE REAL SYMMETRIC AND B IS POSITIVE DEFINITE

REV REVERSE THE ORDER OF REAL POLYNOMIAL COEFFICIENTS IN AN ARRAY

RICH ENRICH A GIVEN CURVE DEFINED BY AN ARRAY OF POINTS SO AS TO SATISFY A SPECIFIED CHORD HEIGHT TOLERANCE

RKINIT SOLVE A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AT A POINT B WITH INITIAL VALUES GIVEN AS A POINT A

ROMBG EVALUATE THE INTEGRAL OF A REAL FUNCTION OF ONE REAL VARIABLE OVER A FINITE INTERVAL USING ROMBERG INTEGRATION

RQNW T USES QNWT TO SOLVE SYSTEMS OF NONLINEAR, ALGEBRAIC OR TRANSCENDENTAL EQUATIONS (IT APPEARS TO BE USEFUL IN THAT IT DOES NOT GIVE UP ON DIFFICULT PROBLEMS AS EASILY AS OTHER MSL SUBROUTINES - QNWT SOLVED 34 OF 40 TEST CASES, RQNW T SOLVED ALL 40)

RUNSA8 COUNT THE NUMBER OF RUNS ABOVE AND BELOW ZERO OF DIFFERENT LENGTHS AND THE EXPECTED NUMBER OF RUNS FOR A SAMPLE WHICH IS RANDOMLY SELECTED FROM A POPULATION SYMMETRICALLY DISTRIBUTED ABOUT ZERO

RUNSUD COUNT THE RUNS UP AND DOWN OF DIFFERENT LENGTHS IN A SAMPLE AND DETERMINE THE EXPECTED NUMBER OF RUNS OF DIFFERENT LENGTHS FOR A RANDOM SAMPLE

SBP SUBTRACT COEFFICIENTS OF LIKE POWERS OF TWO REAL POLYNOMIALS

SCONG SOLVE THE EQUATION SYSTEM $AX - \bar{B} = B - \bar{B}$ BY THE CONJUGATE GRADIENT METHOD - DESIGNED TO BE USED WHEN THE MATRIX A IS LARGE BUT HAS MANY ZERO ELEMENTS

SEARCH USED IN THE TBLU PACKAGE TO PERFORM A BINARY TABLE SEARCH

SEPAR FIND ALL EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX

SEPAR2 FIND A SUBSET OF EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX

SHRINK COMPUTE THE COEFFICIENTS OF THE POLYNOMIAL $P(AX)$ FROM THE COEFFICIENTS OF THE POLYNOMIAL $P(X)$ - REAL COEFFICIENTS

SICI EVALUATE THE SINE AND COSINE INTEGRALS

SIGSM PERFORM SMOOTHING OF A TRIGONOMETRIC SERIES BY USE OF LANCZOS SIGMA-FACTORS

SIMP TRANSFORM EIGENVECTORS OF AN UPPER HESSENBERG MATRIX H, WHERE $H = (P^{**} - 1)AP$, TO EIGENVECTORS OF THE SIMILAR MATRIX A

SIMPRC EVALUATE THE INTEGRAL OF ANY FUNCTION $Y = F(X)$ BETWEEN THE LIMITS A AND B USING SIMPSON'S RULE

SINEVL EVALUATE A SINE POLYNOMIAL AT A GIVEN POINT

SINSER INTERPOLATE A SET OF N (ABSCISSA,ORDINATE)-PAIRS

SMOOCUR PERFORM SMOOTHING

SMOOTH COMPUTE A VECTOR OF SMOOTHED FUNCTION VALUES GIVEN VECTORS OF ARGUMENT AND CORRESPONDING FUNCTION VALUES

SMTVX MULTIPLY THE TRANSPOSE OF A LARGE, SPARSE MATRIX BY A VECTOR

SMVX MATRIX-VECTOR MULTIPLICATION WHEN THE MATRIX IS LARGE AND SPARSE

SPDCOM DECOMPOSE A POSITIVE DEFINITE SYMMETRIC MATRIX WITHOUT USING THE SQUARE ROOT ROUTINE

SPDFEM SOLVE $LY=B$ AND $X=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM $AX=B$ (B IS A MATRIX OF M COLUMN VECTORS, AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, AND D THE DIAGONAL MATRIX OBTAINED FROM SPDCOM)

SPDFBS SOLVE $LY=B$ AND $X=Y$ BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM $AX=B$ (B IS A COLUMN VECTOR, AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, AND D THE DIAGONAL MATRIX OBTAINED FROM SPDCOM)

SPDSOM SOLVE A POSITIVE DEFINITE SYSTEM $AX=B$ HAVING M RIGHT-HAND SIDES WITHOUT USING THE SQUARE ROOT ROUTINE

SPDSCS SOLVE A POSITIVE DEFINITE SYSTEM $AX=B$ HAVING ONE RIGHT-HAND SIDE WITHOUT USING THE SQUARE ROOT ROUTINE

SPITRM SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS WITHOUT USING THE SQUARE ROOT ROUTINE WITH ITERATIVE REFINEMENT

SPITRS SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS WITHOUT USING THE SQUARE ROOT ROUTINE WITH ITERATIVE REFINEMENT

SPLINE CONSTRUCT A 5TH DEGREE SPLINE INTERPOLATING A SET OF EQUISPACED DATA

START READ IN AND LIST INPUT DATA WHICH IS TO BE ENRICHED BY USING OTHER MSL ROUTINES

SUPDIA REDUCE A COMPLEX MATRIX TO UPPER HESSENBERG FORM BY SIMILARITY TRANSFORMATIONS, USING UNITARY MATRICES

SUPDIR REDUCE A REAL MATRIX TO UPPER HESSENBERG FORM

SUMPS COMPUTE DOUBLE PRECISION SUMS OF THE POWERS OF OBSERVATIONS

SURFS FIT A SMOOTH SURFACE WITH CONTINUOUS FIRST PARTIAL DERIVATIVES TO A SET OF POINTS DEFINED OVER A RECTANGULAR GRID

SYMLR FIND ALL EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX

SYNGR	FIND ALL EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX
TBLU1	TABLE SEARCH AND INTERPOLATION WITH ONE INDEPENDENT VARIABLE
TBLU2	TABLE SEARCH AND INTERPOLATION WITH TWO INDEPENDENT VARIABLES
TBLU3	TABLE SEARCH AND INTERPOLATION WITH THREE INDEPENDENT VARIABLES
TCDIAG	COMPUTE PARTIAL OR COMPLETE EIGENSYSTEMS OF HERMETIAN MATRICES
TERP1	POLYNOMIAL INTERPOLATION FOR ONE INDEPENDENT VARIABLE
TERP2	POLYNOMIAL INTERPOLATION FOR TWO INDEPENDENT VARIABLES
TERP3	POLYNOMIAL INTERPOLATION FOR THREE INDEPENDENT VARIABLES
TRDCNP	PERFORM TRIANGULAR DECOMPOSITION OF A TRIDIAGONAL MATRIX WITHOUT PIVOTING
TRDCOM	PERFORM TRIANGULAR DECOMPOSITION OF A TRIDIAGONAL MATRIX WITH PARTIAL PIVOTING
TRDCPM	PERFORM BACK SUBSTITUTION
TRDSOM	SOLVE A TRIDIAGONAL SYSTEM OF EQUATIONS USING TRIANGULAR DECOMPOSITION WITH PARTIAL PIVOTING AND BACK SUBSTITUTION
TRDSUB	PERFORM BACK SUBSTITUTION
TRDWNP	SOLVE A TRIDIAGONAL SYSTEM OF EQUATIONS USING TRIANGULAR DECOMPOSITION WITHOUT PIVOTING AND BACK SUBSTITUTION
TRGDIF	DIFFERENTIATE FORMALLY A TRIGONOMETRIC POLYNOMIAL
TRGINT	INTEGRATE FORMALLY A TRIGONOMETRIC POLYNOMIAL
TRIDI	REDUCE A REAL, SYMMETRIC MATRIX TO TRIDIAGONAL FORM BY USE OF HOUSEHOLDER'S REDUCTION
TRILOM	SOLVE A LOWER TRIANGULAR SYSTEM $LX=B$ WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS
TRILOS	SOLVE A LOWER TRIANGULAR SYSTEM $LX=B$ WHERE B IS A SINGLE COLUMN VECTOR
TRIUPM	SOLVE AN UPPER TRIANGULAR SYSTEM $UX=B$ WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS
TRIUPS	SOLVE AN UPPER TRIANGULAR SYSTEM $UX=B$ WHERE B IS A SINGLE COLUMN VECTOR
TRLCIN	INVERT A LOWER TRIANGULAR MATRIX
TRUPIN	INVERT AN UPPER TRIANGULAR MATRIX

UNCSPL CONSTRUCT A NONLINEAR CUBIC SPLINE WITH CONTINUOUS SECOND DERIVATIVE THROUGH A GIVEN SET OF DATA

URAND GENERATE UNIFORMLY DISTRIBUTED PSEUDO-RANDOM NUMBERS WITH THE SPECIFIED UPPER AND LOWER LIMITS AND STORE VALUES AS ONE VARIABLE IN A MULTIPLEXED DATA ARRAY

VALVEC FIND ALL (OR A SUBSET OF) EIGENVECTORS OF A COMPLEX MATRIX

VARORD ARRANGE THE OBSERVATIONS OF ONE OF THE VARIABLES IN A MULTIPLEXED DATA ARRAY SO THAT THESE OBSERVATIONS ARE STORED IN INCREASING ORDER

VECORD ORDER A SET OF COMPLEX NUMBERS ACCORDING TO MAGNITUDE, EITHER INCREASING OR DECREASING

VECTOR GIVEN A GOOD APPROXIMATION TO AN EIGENVALUE OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX, FIND THE CORRESPONDING EIGENVECTOR AND TRANSFORM THE RESULT ACCORDING TO STORED INFORMATION ABOUT THE ORIGINAL, FULL MATRIX

VIP COMPUTE THE INNER PRODUCT OF TWO VECTORS

VIPA COMPUTE THE INNER PRODUCT OF TWO VECTORS AND ADD IT TO AN INCOMING VALUE C

VIPD COMPUTE THE INNER PRODUCT OF TWO VECTORS WITH DOUBLE PRECISION ACCUMULATION

VIPDA COMPUTE THE INNER PRODUCT OF TWO VECTORS WITH DOUBLE PRECISION ACCUMULATION AND ADD IT TO AN INCOMING VALUE C

VIPDS COMPUTE THE INNER PRODUCT OF TWO VECTORS WITH DOUBLE PRECISION ACCUMULATION AND SUBTRACT IT FROM AN INCOMING VALUE C

XIRAND GENERATE RANDOM FLOATING POINT NUMBERS BETWEEN TWO GIVEN VALUES - EACH OF THE FLOATING POINT NUMBERS BETWEEN THE GIVEN LIMITS HAS AN EQUAL PROBABILITY OF OCCURRING

XPLOT PRINTER PLOT OF UP TO 5 VARIABLES OR SETS OF DATA (ORDINATE) IN THE ORDER IN WHICH THE VALUES ARE STORED (ABSCISSA)

XYPLOT PRINTER PLOT OF UP TO 5 ORDINATE VARIABLES VERSUS A SINGLE ABSCISSA VARIABLE WHERE THE NUMBER OF VALUES FOR THE ABSCISSA IS THE SAME AS THE NUMBER OF VALUES FOR EACH OF THE ORDINATE VARIABLES

ZAFUJ FIND N ZEPOS OF AN ARBITRARY COMPLEX-VALUED FUNCTION OF A COMPLEX VARIABLE

ZAFUM FIND N ZEROS OF AN ARBITRARY COMPLEX-VALUED FUNCTION OF A COMPLEX VARIABLE

ZAFUR FIND N ZEROS OF AN ARBITRARY REAL-VALUED FUNCTION OF A REAL VARIABLE

ZCOUNT COUNT THE NUMBER OF TIMES A FUNCTION $F(Z)$ CIRCLES THE ORIGIN AS Z TRANSVERSES ANY CONTOUR MADE UP OF STRAIGHT LINE SEGMENTS IN A COMPLEX PLANE, AND HENCE THE NUMBER OF ZEROS OF $F(Z)$ WITHIN CLOSED CONTOURS (IF THERE ARE POLES WITHIN THE CONTOUR THEN THE PHRASE "NUMBER OF ZEROS" SHOULD BE REPLACED BY "NUMBER OF ZEROS - NUMBER OF POLES")

ZRNM COMPUTE THE MEAN VALUE OF A SET OF OBSERVATIONS AND SUBTRACTS THE MEAN FROM EACH OF THE OBSERVATIONS

NSRDC

'NSRDC' IS A LIBRARY OF DTNSRDC WRITTEN AND/OR SUPPORTED SCIENTIFIC AND UTILITY SUBPROGRAMS.

REFERENCES: MOST OF THESE ROUTINES ARE DOCUMENTED IN CCLIB/N, WHICH MAY BE OBTAINED FROM USER SERVICES. THE OTHER DOCUMENTS ARE ON FILE IN USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROGRAM 'PROGDOC' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'NSRDC' INCLUDE:

AC	GET ACCOUNT NUMBER FOR THIS JOB
ADJL	LEFT ADJUST A LINE OF WORDS LEAVING ONE SPACE BETWEEN WORDS
ADJR	RIGHT ADJUST A LINE OF WORDS LEAVING ONE SPACE BETWEEN WORDS
AI	AIRY FUNCTION INTEGRAL
ALTIME	OBTAIN CPA, CPB, CP, PP, IO AND WALL CLOCK TIMES SINCE START OF JOB (OR INTERCOM SESSION)
AMAXE	FIND MAXIMUM VALUE OF AN ARRAY (ALSO CONTAINS MAXE)
AMINE	FIND MINIMUM VALUE OF AN ARRAY (ALSO CONTAINS MINE)
ANOVA1	ONE-WAY ANALYSIS OF VARIANCE WITH UNEQUAL N
ANOVA2	TWO-WAY ANALYSIS OF VARIANCE WITH EQUAL N
APGWR	EXPONENTIATION OF POWER SERIES - ONE VARIABLE
ARDGFT	PROPERTIES OF U.S. STANDARD ATMOSPHERE (1962)
ASHIFT	SHIFT EACH WORD OF AN ARRAY
ASORT	FTN ALPHANUMERIC SORT
ASORTMV	SORT 2-DIMENSIONAL ARRAY USING MOVLEV
BANR	PRINT A BANNER (PAGE)
BEJY0	ZERO-ORDER BESSEL FUNCTIONS FOR REAL ARGUMENTS
BEJY1	FIRST ORDER BESSEL FUNCTIONS FOR REAL ARGUMENTS
BESST	MODIFIED BESSEL FUNCTION OF THE FIRST KIND
BESSJ	BESSEL FUNCTION OF THE FIRST KIND
BESSK	MODIFIED BESSEL FUNCTION OF THE SECOND KIND

BESSY	BESSEL FUNCTION OF THE SECOND KIND
BMAN	SOLVE SYSTEM $AX=B$ FOR BANDED SYMMETRIC MATRICES
BPOWR	EXPONENTIATION OF POWER SERIES IN TWO VARIABLES
BSJ	SPHERICAL BESSEL FUNCTION
CBSF	COMPLEX BESSEL FUNCTION FOR LARGE ARGUMENT
CEI3	COMPLETE ELLIPTIC INTEGRAL OF THE THIRD KIND
CENTER	CENTER A CHARACTER STRING WITHIN AN OUTPUT FIELD
CGAUSS	COMPLEX SOLUTION OF SIMULTANEOUS EQUATIONS AND DETERMINANT BY ITERATIVE GAUSSIAN ELIMINATION
CHFILL	FILL (PORTION OF) AN ARRAY WITH A CHARACTER
CMPINV	COMPLEX MATRIX INVERSION
COMBES	BESSEL FUNCTIONS FOR COMPLEX ARGUMENT AND ORDER
COMPSTR	COMPARE TWO CHARACTER STRINGS
CONTRACT	SQUEEZE ARRAY OF 1R-FORMAT CHARACTERS TO LEFT (SEE EXPAND)
COTAN	COTANGENT FUNCTION
COUPLE	LOGICALLY CONNECT TWO WORDS
CROTAB	READ TABLES FOR FRMRAN AND FRMRA2 INTERPOLATION
DISCOT	SINGLE OR DOUBLE INTERPOLATION
DMPA	CALLABLE OCTAL AND CHARACTER DUMP OF SPECIFIED PORTION OF USER'S FIELD LENGTH (FL) (BY ACTUAL LOCATION) (NO HEADINGS ARE PROVIDED)
DMPCPA	DUMP JOB CONTROL POINT AREA
DMPFIT	SHORT DUMP OF FTN OR FM FILE INFORMATION TABLE (FIT)
DPROOT	FIND ALL ROOTS OF A REAL DOUBLE PRECISION POLYNOMIAL
DUMPA	GIVE OCTAL AND CHARACTER DUMP OF USER-SPECIFIED AREA
DUMPCPA	EXPANDED DUMP OF JOB CONTROL POINT AREA
DUMPFIT	DETAILED DUMP OF FTN OR RM FILE INFORMATION TABLE (FIT)
DUMPEL	CALLABLE OCTAL AND CHARACTER DUMP OF SPECIFIED PORTION OF USER'S FIELD LENGTH (FL) (BY ACTUAL LOCATION)

ELLI	ELLIPTIC INTEGRAL
ELLIP	ELLIPTIC INTEGRAL
ELTIME	OBTAIN CPA, CPB, CP, PP, IO AND WALL CLOCK TIMES SINCE LAST CALL TO ELTIME
EQU60	LOGICAL COMPARE (OF 2 ARRAYS)
ERF	ERROR FUNCTION
ERROR	ERROR FUNCTION
EXPAND	EXPAND CHARACTER STRING INTO ARRAY OF 1R-FORMAT WORDS (SEE CONTRCT)
EXPINT	EXPONENTIAL INTEGRAL
EXPRM	EXTRACT NEXT PARAMETER FROM EXECUTE CARD
EXTBIT	EXTRACT BITS FROM A WORD
EXTRM	EXTRACT NEXT PARAMETER FROM USER-SUPPLIED PARAMETER STRING
FASTIN	READ AND UNPACK DATA PREPARED ON THE XDS-910 A/D CONVERSION SYSTEM
FBINRD	UNPACK AN INPUT ARRAY (N BITS PER INPUT CHARACTER INTO CDC WORD)
FFT	FAST FOURIER TRANSFORM FOR COMPLEX TABULATED FUNCTION
FFT5	FAST FOURIER TRANSFORM
FGI	FORTTRAN GAUSSIAN INTEGRATION
FINDC	FIND PRESENCE OR ABSENCE OF SPECIFIED CHARACTER IN AN ARRAY (USER SPECIFIES RELATIONAL OPERAND)
FINDW	FIND PRESENCE OR ABSENCE OF SPECIFIED WORD IN AN ARRAY (USER SPECIFIES RELATIONAL OPERAND)
FINDWRD	FIND SPECIFIED WORD IN AN ARRAY
FNOL3	INTEGRATE SYSTEM OF ORDINARY DIFFERENTIAL EQUATIONS
FRESNEL	EVALUATE FRESNEL INTEGRALS
FRMRAN	LINEAR TABLE INTERPOLATION (ONE OR TWO INDEPENDENT VARIABLES)
FRMRA2	LINEAR TABLE INTERPOLATION (MULTIPLE INDEPENDENT VARIABLES)
FTNRFL	GET/SET CORE SIZE

GAMCAR	COMPLEX GAMMA FUNCTION OF A COMPLEX ARGUMENT HAVING POSITIVE REAL PART
GAMMA	INCOMPLETE OR COMPLETE GAMMA FUNCTION
GAUSS	SIMULTANEOUS EQUATION SOLUTION WITH DETERMINANT BY ITERATIVE GAUSSIAN ELIMINATION
GETCHA	EXTRACT CHARACTER FROM SPECIFIED POSITION IN AN ARRAY
GETCHR	EXTRACT CHARACTER FROM SPECIFIED POSITION IN A WORD
GETFIT	GET SPECIFIED FIT ADDRESS
GETLENS	GET ACTUAL LOCAL FILE NAMES (FOR FTN)
GETPRM	GET ALL PARAMETERS ON EXECUTE CARD
GETRA	GET PROGRAM COMMUNICATION REGION (RA+0 THRU RA+77B)
GMHAS	HARMONIC ANALYSIS
GODROP	ISSUE USER-SPECIFIED GO/DROP MESSAGE
HELP	COMPLEX ZEROES OF REAL OR COMPLEX POLYNOMIAL
HEPE	GET TERMINAL ID FOR THIS JOB
HIFAC	HIGHEST COMMON FACTOR OF TWO POLYNOMIALS
IAOC	COUNT ONE-BITS IN SPECIFIED WORD
IBUNP	UNPACK 12-BIT BYTES FROM ARRAY
ICOM	INTERACTIVE COMMUNICATOR (SYMBOLIC) -- READ RESPONSE AND COMPARE WITH LIST OF VALID RESPONSES
ICOMN	INTERACTIVE COMMUNICATOR (INTEGER NUMERIC) -- READ NUMBER AND TEST TO SEE IF IN SPECIFIED RANGE
IDAYWEK	FUNCTION TO DETERMINE THE DAY OF THE WEEK FOR ANY DATE FROM 10/15/1582 THRU 02/28/4000
IDID	GET USER INITIALS (AND INTERCOM USER ID) FROM CHARGE CARD OR LOGIN
IDIGIT	CHECK FOR DIGITS IN A FIELD WITHIN A WORD
IFINDCH	FIND FIRST OCCURRENCE OF SPECIFIED CHARACTER IN ARRAY
IFMTV	FAST I-FORMAT DECODE OF VARIABLE LENGTH INPUT

IHMS	CONVERT SECONDS TO ' HH.MM.SS.' (SEE ISEC)
IPAKLET	SQUEEZE LEFT AND REMOVE ZEROS (00B) AND BLANKS (55B), RETURN NUMBER OF CHARACTERS
IROMAN	CONVERT ROMAN NUMBERS TO INTEGER
ISEC	CONVERT HH.MM.SS TO SECONDS (SEE IHMS)
ISITCNF	TEST FOR CONNECTED FILE
ISTAPE	GENERATE TAPE NAME 'TAPENN'
ISUMIT	SUM ELEMENTS OF INTEGER ARRAY
JGDATE	CONVERT ANY GREGORIAN DATE TO A JULIAN DATE AND VICE VERSA (MULTI-YEAR)
JOBNAME	GET NOS/BE JOB NAME FOR THIS JOB
JOBORG	GET JOB OPGIN (BATCH, INTERCOM, GRAPHICS, MULTI-USER)
JULIAN	CONVERT ANY GREGORIAN DATE TO A JULIAN DATE AND VICE VERSA (SINGLE YEAR)
KUTMER	INTEGRATE A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS USING THE KUTTA-MERSON FOURTH-ORDER, SINGLE-STEP METHOD
LASTC	FIND LAST NON-BLANK CHARACTER IN ARRAY
LASTWRD	FIND LAST WORD OF ARRAY WHICH CONTAINS A NON-BLANK CONTAINS A NON-BLANK
LBYT	EXTRACT VARIABLE LENGTH BYTE
LEFTADJ	SQUEEZE LEFT AND REMOVE BLANKS AND 00B (USER MAY SUPPLY TRAILING FILL CHARACTER)
LINE6	SET PRINT FILE TO 6 LINES PER INCH
LINE8	SET PRINT FILE TO 8 LINES PER INCH
LOGGAM	LOGARITHM OF GAMMA FUNCTION FOR COMPLEX ARGUMENT
LSQSUB	GENERAL WEIGHTED LEAST SQUARES FIT
MACHINE	GET 4-WORD SYSTEM HEADING
MAM	SOLVE SYMMETRIC SYSTEM OF LINEAR EQUATIONS
MAM200	SOLVE 200 SYMMETRIC LINEAR EQUATIONS
MASKIT	DYNAMIC MASK GENERATOR

MATINS	MATRIX INVERSE WITH SIMULTANEOUS EQUATION SOLUTION AND DETERMINANT
MAXE	FIND MAXIMUM VALUE OF AN ARRAY (ALSO CONTAINS AMAXE)
MFETCH	FETCH A SINGLE WORD FROM USER'S FL (SEE MSET)
MFY	OBTAIN THE MAINFRAME ON WHICH THE PROGRAM IS RUNNING
MINE	FIND MINIMUM VALUE OF AN ARRAY (ALSO CONTAINS AMINE)
MINMAX	GENERALIZED NONLINEAR ITERATOR
MONTH	FROM A DATE (MM/DD/YY) FIND THE MONTH AND RETURN FULL SPELLING AND 3- OR 4-CHARACTER ABBREVIATION
MOVSTR	MOVE A STRING OF CHARACTERS FROM ONE ARRAY TO ANOTHER
MSET	SET A SINGLE WORD IN USER'S FL (SEE MFETCH)
NEWDAT	ADD/SUBTRACT SPECIFIED NUMBER OF DAYS TO/FROM A GIVEN DATE
NFILL	FILL ELEMENTS 1 THRU N OF AN ARRAY WITH THE VALUES 1 THRU N, RESPECTIVELY
NFILLT	TEST AN ARRAY FOR THE PRESENCE OF THE INTEGERS 1 THRU N IN ELEMENTS 1 THRU N, RESPECTIVELY
NROOTS	REAL AND COMPLEX ROOTS OF REAL POLYNOMIAL
NUMEXEC	GET NUMBER OF EXECUTE CARD PARAMETERS WHICH WERE USED IN THIS EXECUTION OF THE PROGRAM
NUMVAR	DETERMINE NUMBER OF ARGUMENTS IN CALL TO SUBPROGRAM
OFMTDE	FAST O-FORMAT DECODE
OFMTV	FAST O-FORMAT DECODE OF VARIABLE LENGTH INPUT
OPLSA	ORTHOGONAL POLYNOMIAL LEAST SQUARE APPROXIMATION
OVLNAME	GET NAME OF FILE CURRENTLY BEING EXECUTED
PARGET	GET ALL PARAMETERS OF USER-SUPPLIED PARAMETER STRING
PEPC	SUPPLY DESCRIPTION OF PERMANENT FILE FUNCTION RETURN CODE
PLOTMY	PRINTER PLOT - MULTIPLE CURVES
PLOTPR	PRINTER PLOT - MULTIPLE CURVES
PLOTXY	PRINTER PLOT - SINGLE CURVE
POLDIV	POLYNOMIAL DIVISION
POLYN	LEAST SQUARES POLYNOMIAL FIT

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DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 9/2
COMPUTER CENTER LIBRARIES.(U)
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DDC

POWR1 1 TERM IN EXPONENTIATION OF POWER SERIES - ONE VARIABLE

POWR2 1 TERM IN EXPONENTIATION OF POWER SERIES - TWO VARIABLES

PROD2 1 TERM IN PRODUCT OF POWER SERIES - TWO VARIABLES

PROOT FIND ALL ROOTS OF A REAL PLOYNOMIAL

PRTFL PRINT CURRENT FL (OR PUT INTO DAYFILE)

PRTIME GET AND PRINT CPA, CPB, CP, PP, IO AND WALL CLOCK TIMES SINCE
LAST CALL AND PRINT USER-SUPPLIED MESSAGE

PSI COMPLEX PSI FUNCTION

PUTCHA INSERT CHARACTER INTO SPECIFIED POSITION IN AN ARRAY

PUTCHP INSERT CHARACTER INTO SPECIFIED POSITION IN A WORD

QSORT IN-CORE ASCENDING SORT FOR ARRAYS LARGER THAN 500 WORDS

QSORT1 IN-CORE ASCENDING SORT WITH RE-ORDERING OF ASSOCIATED ARRAY
(FOR ARRAYS LARGER THAN 500 WORDS)

QUADG INTEGRAL BY GAUSS-LEGENDRE 10-POINT QUADRATURE

QUART REAL OR COMPLEX ROOTS OF QUARTIC

RANUM NORMALLY DISTRIBUTED RANDOM NUMBERS

RCPA READ (A PORTION OF) CONTROL POINT AREA

RECOVRD ON RECOVERY, PRINT EXCHANGE JUMP PACKAGE, RA+0 THRU RA+77B

REDUCE REDUCE FL TO MINIMUM -OR- REQUEST ADDITIONAL FL RELATIVE TO
START OF BLANK COMMON

REPLAC REPLACE ONE CHARACTER WITH ANOTHER IN AN ARRAY

REPLACM REPLACE SEVERAL CHARACTERS WITH OTHER CHARACTERS

REPLHI REPLACE ALL CHARACTERS GREATER THAN SPECIFIED CHARACTER WITH
NEW CHARACTER

REPLLO REPLACE ALL CHARACTERS LESS THAN SPECIFIED CHARACTER WITH NEW
CHARACTER

REPLNE REPLACE ALL CHARACTERS (EXCEPT SPECIFIED CHARACTER) WITH A
SPECIFIED CHARACTER

REQUEST CALLABLE REQUEST COMMAND

RFFT FAST FOURIER TRANSFORM FOR REAL TABULATED DATA

RFSN REVERSE FAST FOURIER TRANSFORM

ROOTER	GENERAL ROOT FINDER
ROUTE	CALLABLE ROUTE COMMAND
SBYT	STORE VARIABLE LENGTH BYTE
SEMIC	REPLACE DISPLAY CODE 00B WITH 77B (SEMI-COLON)
SENT	MOVE WORDS FROM ONE APRAY TO ANOTHER, FORWARD OR BACKWARD
SETREW	CONVERT ALPHABETIC REWIND OPTION INTO RM OPEN AND CLOSE CODES
SHIFTA	SHIFT ARRAY A SPECIFIED NUMBER OF BITS (CROSSING OVER WORD BOUNDARIES)
SIMP	SIMPSON'S RULE INTEGRATION
SIMPUN	SIMPSON'S RULE INTEGRATION - UNEQUAL INTERVALS
SKPFIL	FORWARD OR BACKWARD SKIP FOR FORTRAN FILES
SKPSTAT	GET STATUS OF LAST CALL TO SKPFIL
SKWEZL	SQUEEZE LEFT AND REMOVE BLANKS AND 00B
SKWEZR	SQUEEZE RIGHT AND REMOVE BLANKS AND 00B
SMOOTH	LEAST SQUARES POLYNOMIAL SMOOTHING
SNCNDN	JACOBIAN ELLIPTIC FUNCTION
SPLFIT	SPLINE CURVE FIT
SQFIT	POLYNOMIAL LEAST SQUARE FIT
SSORT	FTN SHELL SORT
SSORTF	FTN CALLABLE SHELL SORT FOR TWO-DIMENSIONAL ARRAYS
SSORTI	FTN CALLABLE SHELL SORT FOR TWO-DIMENSIONAL ARRAYS
SSORTL	FTN LOGICAL SHELL SORT
STUTEE	STUDENT'S T DISTRIBUTION
SUMIT	SUM ELEMENTS OF REAL ARRAY
TRAILBZ	CHANGE TRAILING BLANKS TO ZEROS (00B)
UNLOAD	UNLOAD A FORTRAN FILE
VALCAT	LOGICAL FUNCTION TO VALIDATE A DATE FORMAT
VALIDT	VALIDATE AN ARRAY TO SEE THAT EACH ELEMENT IS ONE OF A USER-SPECIFIED LIST

VAPAH1 EIGENVALUES AND EIGENVECTORS OF A GENERAL REAL MATRIX

VAPAH2 IMPROVED ESTIMATES AND BOUNDS FOR EIGENSYSTEM OF A GENERAL REAL MATRIX

VFILL FILL AN APRAY WITH USER-SPECIFIED WORD

WEKDAY DETERMINE THE DAY OF THE WEEK FOR ANY GREGORIAN DATE FROM OCTOBER 15, 1582 THRU FEBRUARY 28, 4000

XFIL FILON'S METHOD FOR INTEGRALS WITH SIN AND COS

XOR EXCLUSIVE-OR FUNCTION

ZBLANK CHANGE BLANKS TO 008 AND VICE VERSA

ZEROES REPLACE BLANKS WITH (DISPLAY CODE) ZEROS, MULTIPLE FIELDS

ZEROFL ZERO FIELD LENGTH (SECURITY EOJ)

ZEROS REPLACE BLANKS WITH (DISPLAY CODE) ZEROS, MULTIPLE FIELDS

ZPFPUT PUT USER-SPECIFIED PARAMETERS INTO ARRAY FOR LATER CALL TO ZPFUNC

ZPFUNC CALLABLE PERMANENT FILE FUNCTIONS

ZRTPUT PUT USER-SPECIFIED PARAMETERS INTO AR R LATER CALL TO ROUTE

ZSYSEQ FORTRAN CALLABLE SYSTEM CALL

***** CATALOGUED PROCEDURES *****

A CATALOGUED PROCEDURE IS A SET OF CONTROL CARDS WHICH ACCOMPLISH A TASK. THE COMPUTER CENTER MAINTAINS A LIBRARY OF THESE FOR GENERAL USE. THIS CHAPTER INCLUDES THE DESCRIPTIVE TITLE FOR EACH PROCEDURE IN THE LIBRARY. MOST OF THE PROCEDURES ARE EXECUTED BY:

BEGIN,<PROCNAME>,,<PARAMETERS>.

REFERENCES: CCLIB/P, WHICH MAY BE OBTAINED FROM USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROGRAM 'PROGDOC' (SEE PAGE 1-2).

THE FOLLOWING PROCEDURES ARE AVAILABLE:

ANYLIB	EXECUTE A PROGRAM ON ANY EDITLIB USER LIBRARY (HAVING A PFN OF 1-7 CHARACTERS)
ANYPRO	EXECUTE A PROCEDURE ON ANY CATALOGUED PROCEDURE FILE (HAVING A PFN OF 1-7 CHARACTERS)
AUDIT	SORTED USER AUDIT
CALC3D	THREE-D PROCEDURE FOR CALCOMP 763, 936, 1700 PLOTTERS
CCIRM	PRINT ONE COPY OF COMPUTER CENTER INTRODUCTORY REFERENCE MANUAL
CCLIB	PRINT ONE COPY OF CCLIB, CCLIB/M, CCLIB/N, CCLIB/P, OR CCLIB/U MANUAL
CCPM	PRINT COPIES OF THE COMPUTER CENTER REFERENCE MANUAL
COPYBLK	REBLOCK STRANGER TAPES TO SCOPE STANDARD FILES (BOTH UNBLOCKED CARD AND PRINT LINE IMAGE TAPES AND BLOCKED STRANGER TAPES)
COPYLIB	CONDENSE (AND SORT) AN EDITLIB USER LIBRARY PRESERVING AL, FL, FLO VALUES. BINDEK AND LISTBIN LISTS ARE PROVIDED.
COPYS	ATTACH, EXECUTE AND RETURN THE RIQSCOPYS PROGRAM
CPINDEX	CONVERT SEQUENTIAL PROCEDURE FILE TO RANDOM
CV29	CONVERT TO 029 PUNCH CODE
DOCADD	ADD ONE DOCUMENT TO A DOCUMENTATION FILE
DOCDELE	DELETE ONE DOCUMENT FROM A DOCUMENTATION FILE
DOCDOC	LIST DOCUMENTATION FOR PROCEDURES DOCADD, DOCDELE, DOCDOC, DOCFIL, DOCGET, DOCLIST, DOCREPL
DOCFIL	ATTACH A DOCUMENTATION FILE
DOCGET	GET (EXTRACT) SPECIFIED DOCUMENT FROM A DOCUMENTATION FILE

DOCLIST LIST DOCUMENT NAMES (ON *DECK) CARDS IN A DOCUMENTATION FILE

DOCREPL REPLACE ONE DOCUMENT IN A DOCUMENTATION FILE

DOCTAPE EXTRACT DOCUMENTS FROM TAPE

GRIFE ALLOW USER TO MAKE GRIPES OR SUGGESTIONS DIRECTLY TO THE COMPUTER

LIPSET1/2 CREATE SIMPLE ABSOLUTE USING ONE/TWO EDITLIB LIBRARY(IES)

LINE#/6 SET PRINT FILE TO 8/6 LINES PER INCH

MFY TELL USER THE MAINFRAME ON WHICH HE IS RUNNING

MNSRDC EXECUTE A PROGRAM ON EDITLIB USER LIBRARY 'MNSRDC'

MYPROC EXECUTE A PROCEDURE ON FILE 'PROFIL' CATALOGED UNDER ANY ID

NOGO CREATE SIMPLE ABSOLUTE FROM RELOCATABLE

NOPEUN INSURE THAT A BATCH JOB CANNOT BE RERUN BY OPERATOR TYPE-IN

PGMTAPE EXTRACT SOURCE PROGRAMS FROM TAPE

PM CREATE CERTAIN PRINT MESSAGE (PM) RECORDS

PROADD ADD ONE PROCEDURE TO A SEQUENTIAL PROCEDURE FILE

PROALL LIST PROCEDURE NAMES, PROCEDURE HEADERS AND THE PROCEDURES IN A SEQUENTIAL PROCEDURE FILE (COMBINES PRONAM, PROHDR AND PROLIST)

PRODELE DELETE ONE PROCEDURE FROM A SEQUENTIAL PROCEDURE FILE

PRODOC LIST DOCUMENTATION FOR PROCEDURES PROADD, PROALL, PRODELE, PRODOC, PROGET, PROHDR, PROLIST, PRONAM, PROREPL

PROGET GET (EXTRACT) ONE PROCEDURE FROM A SEQUENTIAL PROCEDURE FILE

PROGRAM EXECUTE A CATALOGED PROGRAM (NOT IN A LIBRARY)

PROHDR LIST PROCEDURE HEADERS IN A PROCEDURE FILE

PROLIST LIST PROCEDURE(S) IN A SEQUENTIAL PROCEDURE FILE

PRONAM LIST NAMES OF PROCEDURES IN A SEQUENTIAL PROCEDURE FILE

PROREPL REPLACE ONE PROCEDURE IN A SEQUENTIAL PROCEDURE FILE

RECADD	ADD ONE OR MORE LOGICAL RECORDS TO A FILE
RECDELE	DELETE ONE OR MORE LOGICAL RECORDS FROM A FILE
RECDCC	LIST DOCUMENTATION FOR PROCEDURES RECADD, RECDELE, RECDCC, RECGET, RECREPL
RECGET	EXTRACT ONE OR MORE LOGICAL RECORDS FROM A FILE
RECREPL	REPLACE ONE OR MORE LOGICAL RECORDS IN A FILE
RENAMAC	RENAME AC FIELD ON PERMANENT FILES
RUNEAS	COMPILE AND EXECUTE BASIC PROGRAM (SIMILAR TO EDITOR RUN,BAS FOR USE OUTSIDE EDITOR)
RUNFTN	COMPILE AND EXECUTE FTN PROGRAM (SIMILAR TO EDITOR RUN,FTN FOR USE OUTSIDE EDITOR)
RUINMNF	COMPILE AND EXECUTE MNF PROGRAM
RUNSEQ	COMPILE AND EXECUTE FTN,SEQ PROGRAM (SOURCE PROGRAM IN SEQUENCED FORMAT - TIME-SHARING OPTION)
RUNTS	COMPILE AND EXECUTE FTN,TS PROGRAM (TIME-SHARING OPTION)
SELDDMP	CREATE BACKUP DUMP TAPE OF USER PERMANENT FILES OF AN ACCOUNT NUMBER
SFLLOAD	RESTORE SELECTED ROUTINES FROM A BACKUP DUMP TAPE
SEND	SEND MESSAGES TO AN INTERCOM USER WHO IS NOT LOGGED IN; LIST MESSAGES
STPUCT	GENERATE CROSS-REFERENCE LISTS AND TREE STRUCTURE FROM BINARY RELOCATABLE OBJECT FILE
S2K260	ATTACH FILES FOR S2000 (VERSION 2.60) NATURAL LANGUAGE, FTN, OR COBOL PROCEDURAL LANGUAGE INTERFACE FROM PROPER DEVICE
S2000	ATTACH OR RETURN FILES FOR S2000 NATURAL LANGUAGE, FTN OR COBOL PROCEDURAL LANGUAGE INTERFACE FROM PROPER DEVICE
TI0BITS	LIST FILE OF TI0BITS (HINTS ON IMPROVED COMPUTER USAGE)
TPANPAK	COPY CONTENTS FROM ONE DEVICE SET TO ANOTHER FOR BACKUP

UPDADD ADD ONE DECK TO AN UPDATE LIBRARY

UPDDEL DELETE ONE DECK FROM AN UPDATE LIBRARY

UPDDOC LIST DOCUMENTATION FOR PROCEDURES UPDADD, UPDELE, UPDDOC, UPDGET, UPDLIST, UPDREPL

UPDGET EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,C) AND, OPTIONALLY, ADD EDITOR SEQUENCING

UPGETS EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,S) AND, OPTIONALLY, ADD EDITOR SEQUENCING

UPDGETT EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,T) AND, OPTIONALLY, ADD EDITOR SEQUENCING

UPDLIST LIST DECK/COMDECK NAMES IN UPDATE LIBRARY WITH COUNT OF RECORDS IN EACH DECK/COMDECK

UPDREPL REPLACE ONE DECK IN AN UPDATE LIBRARY

UTILITY EXECUTE A PROGRAM ON LIBRARY 'UTILITY'

VENUS ATTACH AND EXECUTE ONE OF THE VENUS RETRIEVAL PROGRAMS

WHATLIB LIST LIBRARIES SPECIFIED IN LAST 'LIBRARY' COMMAND

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