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COMPUTER CENTER LIBRARIES.(U)
AUG 77 D V SOMMER, S E GOOD

UNCLASSIFIED CMLD-77-12 NL

1 OF 2
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DAVID W. TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

Bethesda, Md. 20084

COMPUTER CENTER LIBRARIES

by

David V. Sommer

&

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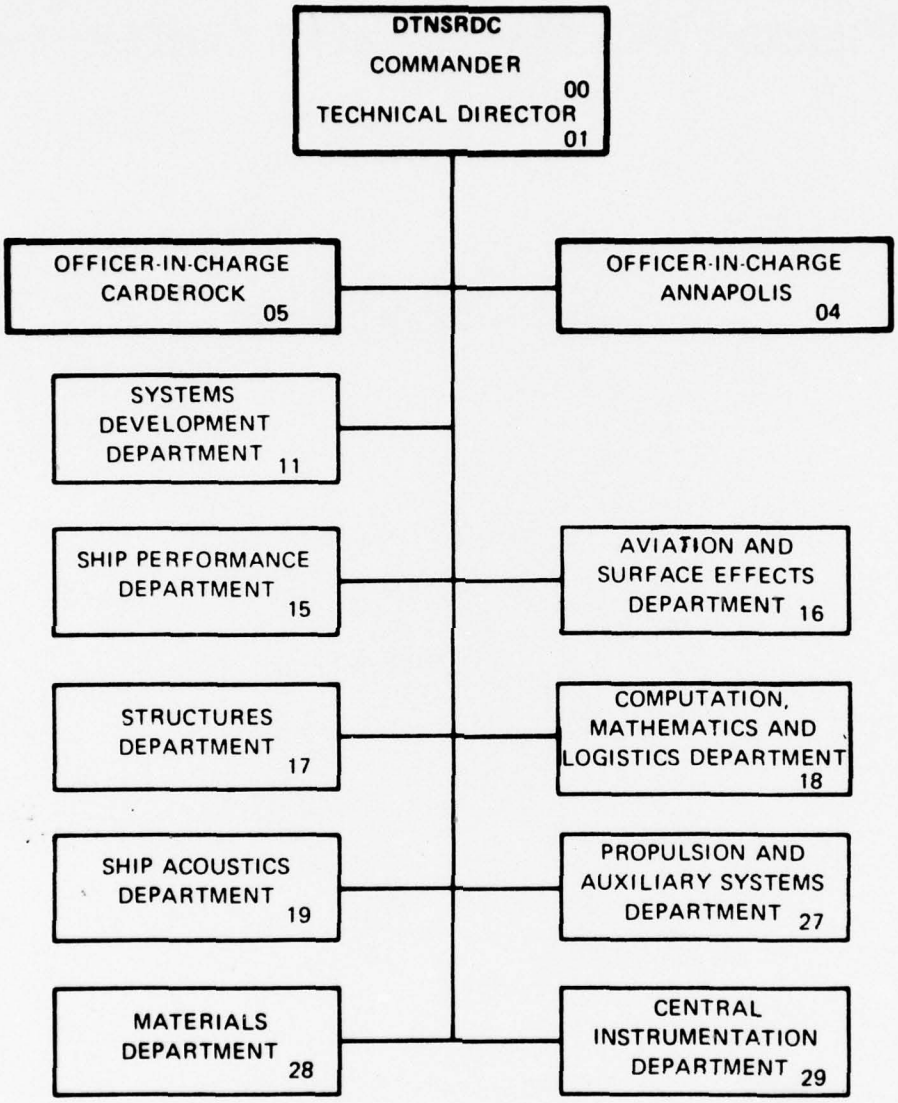
Computation, Mathematics
and Logistics Department

August 1977

CMLD-77-12

MAJOR DTNSRDC ORGANIZATIONAL COMPONENTS



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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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AB

DAVID W. TAYLOR
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER
BETHESDA, MARYLAND 20084

COMPUTER CENTER LIBRARIES

BY
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USER SERVICES BRANCH

CODE 1892

COMPUTATION, MATHEMATICS AND LOGISTICS DEPARTMENT
DEPARTMENTAL REPORT

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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/NSROC (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/MNSROC (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 (CARDEROCK: 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

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C2 ROOTS OF POLYOMIALS
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F4 SIMULTANEOUS LINEAR EQUATIONS

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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

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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
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K2 INTERNAL-TO-INTERNAL (RELOCATION)
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K4 TAPE
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L5 DISASSEMBLY AND DERELATIVIZING
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L7 COMPUTER LANGUAGE TRANSLATORS

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N2 DUMPING
N3 MEMORY VERIFICATION AND SEARCHING
N4 BREAKPOINT PRINTING

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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
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T2 CHEMISTRY
T3 OTHER PHYSICAL SCIENCES (GEOLOGY, ASTRONOMY, ETC.)
T4 ENGINEERING
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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
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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 - BIMED (2-1)
- C - BIMEDP (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/*/
FMFRAC	/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/ /
CLDIV	/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/*/
CLDIV	/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/ /	LDIV	/S/M/ /	SHRINK	/S/M/ /
CPDIV	/S/M/ /	MPYR	/S/M/ /	SINEVL	/S/M/ /
CPTRAN	/S/M/ /	NSLVL	/S/M/ /		

C2 ROOTS OF POLYOMIALS

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/ /
BEJY0	/S/N/*/	EI	/S/F/ /	MERFCI	/S/I/ /
BEJY1	/S/N/*/	ELF	/S/M/ /	MERFI	/S/I/ /
BESEI0	/S/F/ /	ELIEM	/S/F/ /	MGAMMA	/S/I/ /
BESEI1	/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/ /
BESI0	/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/ /
BESSI	/S/N/*/	ERF	/S/N/*/	MMDELK	/S/I/ /
BESSJ	/S/N/*/	ERFINV	/S/M/ /	MMKELO	/S/I/ /
BESSK	/S/N/*/	ERROR	/S/N/*/	MMKELO	/S/I/ /
BESSY	/S/N/*/	EXPEI	/S/F/ /	MMKEL1	/S/I/ /
BESY	/S/F/ /	EXPINT	/S/N/*/	MNORIS	/S/I/ /
BSJ	/S/M/ /	FRESNEL	/S/N/N/	NBESJ	/S/M/ /
BSJ	/S/N/N/	GAMAIN	/S/M/ /	PSI	/S/F/ /
CBSF	/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/ /	NRSG	/S/M/ /	RQNWT	/S/M/ /
NONLIQ	/S/M/ /	QNWT	/S/M/ /	ZSYSTM	/S/I/ /

C5 SIMULTANEOUS TRANSCENDENTAL EQUATIONS

QNWT	/S/M/ /	RQNWT	/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/*/
DBCQDU	/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

DASCRU /S/I/ /	DVERK /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

ACFI /S/M/ /	IBCIEU /S/I/ /	SEARCH /S/M/ /
AITKEN /S/M/ /	ICSICU /S/I/ /	SINSER /S/M/ /
ATSM /S/M/ /	ICHSCU /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/ /
CDECOM /S/M/ /	FFT5 /S/N/*/	LSQSUB /S/N/*/
CFCME /S/M/ /	FHRNEW /S/M/ /	OPLSA /S/N/N/
CHEBAP /S/M/ /	FITLIN /S/M/ /	ORTHFT /S/M/ /
CHEBEV /S/M/ /	FLGNEW /S/M/ /	PLAGR /S/M/ /
COMCUB /S/M/ /	FLSQFY /S/M/ /	PLRG /M/R/M/
CUBIC2 /S/M/ /	FOURAP /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/
FCGM2 /S/M/ /	GMI /S/M/ /	RFSN /S/N/N/
FCLSQ /S/M/ /	IBCICU /S/I/ /	SPLFIT /S/N/*/
FDLSQ /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/ /	UNCSPL /S/M/ /

E3 SMOOTHING

ICSMOU /S/I/ /	SIGSMT /S/M/ /	SMOOTH /S/N/*/
ICSSCU /S/I/ /	SMOCUB /S/M/ /	
MILN2 /S/M/ /	SMOOTH /S/M/ /	

E4 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/ /
BCHSDC	/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/ /
BDTRGI	/S/I/ /	ORTHO	/S/A/ /	VCVTSQ	/S/I/ /
BDTRGO	/S/I/ /	ORTHO2	/S/A/ /	VHSH2C	/S/I/ /
BMD10S	/M/B/ /	ORTRAN	/S/E/ /	VHSH2R	/S/I/ /
CBAL	/S/E/ /	PRDSUM	/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/ /
FCOMB	/S/M/ /	TRED1	/S/E/ /	VMULFP	/S/I/ /
FIGI	/S/E/ /	TRED2	/S/E/ /	VMULFQ	/S/I/ /
FIGI2	/S/E/ /	TRED3	/S/E/ /	VMULFS	/S/I/ /
FIP	/S/A/ /	TRIDI	/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/ /	USCRDM	/S/I/ /	VMULSF	/S/I/ /
FMVCX	/S/M/ /	USMNMX	/S/I/ /	VMULSQ	/S/I/ /
FMVX	/S/M/ /	USRDM	/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/ /
HTRIDI	/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/ /
LEQT1B	/S/I/ /	USWTSV	/S/I/ /	VTRAN	/S/I/ /
LEQT1C	/S/I/ /	VABMXF	/S/I/ /	VUABQ	/S/I/ /
LEQT2B	/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/ /	EIGS	/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/ /
CBABK2	/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/ /
CINVIT	/S/E/ /	EQRT1S	/S/I/ /	RSG	/S/E/ /
COMBAK	/S/E/ /	EQRT2S	/S/I/ /	RSGAB	/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/ /
EBBCKC	/S/I/ /	IMTQLV	/S/E/ /	SYMQR	/S/M/ /
EBBCKF	/S/I/ /	IMTQL1	/S/E/ /	TCOIAG	/S/M/ /
EHBCKF	/S/I/ /	IMTQL2	/S/E/ /	TINVIT	/S/E/ /
EHBCKH	/S/I/ /	INIT	/S/A/ /	TQLRAT	/S/E/ /
EHESSC	/S/I/ /	INVIT	/S/E/ /	TQL1	/S/E/ /
EHESSF	/S/I/ /	LATNTR	/S/M/ /	TQL2	/S/E/ /
EHOBKS	/S/I/ /	ORTBAK	/S/E/ /	TRBAK1	/S/E/ /
EHOUSH	/S/I/ /	QREIGN	/S/M/ /	TRBAK3	/S/E/ /
EHOUSS	/S/I/ /	QZABX	/S/A/ /	TRIDIB	/S/E/ /
EIGCC	/S/I/ /	QZVAL	/S/E/ /	TSTURM	/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

BPOSOM	/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/ /
LEQWNE	/S/M/ /	LITWNE	/S/M/ /	SPITRM	/S/M/ /
LEQWNP	/S/M/ /	LITWNP	/S/M/ /	SPITRS	/S/M/ /

F4 SIMULTANEOUS LINEAR EQUATIONS

BFBANP /S/M/ /
BFBSUM /S/M/ /
BITERM /S/M/ /
BITREM /S/M/ /
BITRNP /S/M/ /
BITRPD /S/M/ /
BITWNP /S/M/ /
BLESOM /S/M/ /
BLSWNP /S/M/ /
BMAM /S/N/*/
BPDITM /S/M/ /
BPDSFB /S/M/ /
BPDSOM /S/M/ /
BSUBHT /S/M/ /
CCONGR /S/M/ /
CFBSUM /S/M/ /
CGAUSS /S/N/N/
CGITRF /S/M/ /
CGLESM /S/M/ /
CITERF /S/M/ /
CMPINV /S/N/N/
FBSUBM /S/M/ /
FBSUBS /S/M/ /
FCGM2 /S/M/ /
GAUSS /S/N/N/
GITREM /S/M/ /
GITRES /S/M/ /
GLESOM /S/M/ /
GLESOS /S/M/ /
IMPR1 /S/A/ /
IMPR2 /S/A/ /
INVERS /S/M/ /
INVITR /S/M/ /
ITEREM /S/M/ /
ITERES /S/M/ /
ITRPDM /S/M/ /
ITRPDS /S/M/ /
ITRSPM /S/M/ /
ITRSPS /S/M/ /
LEQS1 /S/A/ /
LEQS2 /S/A/ /
LEQS3 /S/A/ /
LEQS4 /S/A/ /
LEQS5 /S/A/ /
LEQS6 /S/A/ /
LEQT1B /S/I/ /
LEQT1C /S/I/ /
LEQT1F /S/I/ /
LEQT1P /S/I/ /
LEQT2B /S/I/ /
LEQT2C /S/I/ /
LEQT2F /S/I/ /
LEQT2P /S/I/ /
LEQ1PB /S/I/ /
LEQ1S /S/I/ /
LEQ2PB /S/I/ /
LEQ2S /S/I/ /
LESWNE /S/M/ /
LESWNP /S/M/ /
LINSYS /S/M/ /
LINV1F /S/I/ /
LINV1P /S/I/ /
LINV2F /S/I/ /
LINV2P /S/I/ /
LINV3F /S/I/ /
LINV3P /S/I/ /
LIN1PB /S/I/ /
LIN2PB /S/I/ /
LITWNE /S/M/ /
LITWNP /S/M/ /
LLSQAR /S/I/ /
LPSDOR /S/I/ /
LSQHTM /S/M/ /
LSQHTS /S/M/ /
LSQSIT /S/M/ /
LSVALR /S/I/ /
LUDAPB /S/I/ /
LUDATF /S/I/ /
LUDECP /S/I/ /
LUELMF /S/I/ /
LUELMP /S/I/ /
LUELPB /S/I/ /
LUREFF /S/I/ /
LUREFP /S/I/ /
LUREPB /S/I/ /
MAM /S/N/*/
MAM200 /S/N/*/
MATINS /S/N/N/
OFIMA3 /S/I/ /
ORIMP /S/A/ /
ORSOL /S/A/ /
PDITRM /S/M/ /
PDITRS /S/M/ /
PDLSOM /S/M/ /
PDLSOS /S/M/ /
PDSFBM /S/M/ /
PDSFBS /S/M/ /
QR1 /S/M/ /
RQNWT /S/M/ /
SCONG /S/M/ /
SPDFBM /S/M/ /
SPDFBS /S/M/ /
SPDSOM /S/M/ /
SPDSOS /S/M/ /
SPITRM /S/M/ /
SPITRS /S/M/ /
TRDCNP /S/M/ /
TRDCOM /S/M/ /
TRDFBM /S/M/ /
TRDSOM /S/M/ /
TRDSUB /S/M/ /
TRDWNP /S/M/ /
TRILOM /S/M/ /
TRILOS /S/M/ /
TRIUPM /S/M/ /
TRIUPS /S/M/ /
TRLOIN /S/M/ /
TRUPIN /S/M/ /

G0 STATISTICAL ANALYSIS AND PROBABILITY

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

G1 DATA REDUCTION (COMMON STATISTICAL PARAMETERS)

AGGREGA/D/S/ /
AGLMOD /S/I/ /
AMEANS /S/I/ /
AORDR /S/I/ /
BDCOU1 /S/I/ /
BDCOU2 /S/I/ /
BECORI /S/I/ /
BECORO /S/I/ /
BECOVM /S/I/ /
BECVLI /S/I/ /
BECVLO /S/I/ /
BEGRPS /S/I/ /
BEIGRP /S/I/ /
BEIUGR /S/I/ /
BELBIN /S/I/ /
BELPOS /S/I/ /
BEMIRI /S/I/ /
BEMIRO /S/I/ /
BEMMI /S/I/ /
BEMMO /S/I/ /
BMDP1D /M/C/ /
BMDP2D /M/C/ /
BMDP3D /M/C/ /
BMDP4D /M/C/ /
BMDP5D /M/C/ /
BMDP6D /M/C/ /
BMDP7D /M/C/ /
BMDP8D /M/C/ /
BMDP9D /M/C/ /
BMD01D /M/B/ /
BMD04D /M/B/ /
BMD05D /M/B/ /
BMD06D /M/B/ /
BMD07D /M/B/ /
BMD10D /M/B/ /
BMD11D /M/B/ /
BMD13D /M/B/ /
BREAKDO/D/S/ /
CONDESC/D/S/ /
CONTAB /S/D/*/
CORREL /S/D/*/
CORS /S/D/*/
DISTAT /S/D/*/
DLETE /S/M/ /
DSCRPT /S/M/ /
DSCRP2 /S/M/ /
FILTER /S/M/ /
FREQCY /S/D/*/
FREQUEN/D/S/ /
GTMN /S/I/ /
GTMN1 /S/I/ /
OP1RAY /S/M/ /
OP2RAY /S/M/ /
SSPAND /S/I/ /
SSPBLK /S/I/ /
SSRAND /S/I/ /
SSRBLK /S/I/ /
SSSAND /S/I/ /
SSSBLK /S/I/ /
SSSCAN /S/I/ /
SSSEST /S/I/ /
STUTEE /S/N/*/
T-TEST /D/S/ /
TTESTS /S/D/*/
USHIST /S/I/ /
USHIUT /S/I/ /
USHV1 /S/I/ /

G2 CORRELATION AND REGRESSION ANALYSIS

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

G4 ANALYSIS OF VARIANCE

ABALAT /S/I/ /	ANESTU /S/I/ /	BMD02V /M/B/ /
ABIBAN /S/I/ /	ANOVA /D/S/ /	BMD03V /M/B/ /
ACRDAN /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/ /	ARCSAN /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/ /	PGMMA /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/ /
CHSQQ /S/M/ /	GTRTM /S/I/ /	PICHY /S/M/ /
CONRAY /S/M/ /	GTSRT /S/I/ /	PIEXP /S/M/ /
EXRAND /S/M/ /	GTTRT /S/I/ /	PIFDIS /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/ /
GGBTA /S/I/ /	MDBETA /S/I/ /	PINBIN /S/M/ /
GGCAU /S/I/ /	MDBETI /S/I/ /	PINORM /S/M/ /
GGCSS /S/I/ /	MDBIN /S/I/ /	PIPOIS /S/M/ /
GGEOM /S/I/ /	MDBONR /S/I/ /	PIRAYL /S/M/ /
GGEXP /S/I/ /	MDCH /S/I/ /	PIS /S/M/ /
GGHYP /S/I/ /	MDCHI /S/I/ /	PIT /S/M/ /
GGMUL /S/I/ /	MDFD /S/I/ /	PITRNM /S/M/ /
GGNLN /S/I/ /	MDFDRE /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/D/*/
GGTMA1 /S/I/ /	MDTNF /S/I/ /	PRBUNF /S/M/ /
GGTMA2 /S/I/ /	MDTPOS /S/I/ /	PTDIST /S/M/ /
GGTRI /S/I/ /	MNORIS /S/I/ /	PTRNRM /S/M/ /
GGUB /S/I/ /	MSMRAT /S/I/ /	PUNFD /S/M/ /
GGUBF /S/I/ /	NDMPLE /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/ /	NRMNO /S/M/ /	URAND /S/M/ /
GTD2T /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/ /	OFCOEF /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/ /	NBSD /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/ /	NDMPLE /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/	SIMII5 /M/ /R/
MIMIC /M/ /R/	SIMI5 /M/ /R/

I0 INPUT

FASTIN /S/N/*/

I2 OCTAL

OFMTDE /S/N/N/	OFMTV /S/N/N/

I3 DECIMAL

CROTAB /S/N/*/	USRDM /S/I/ /	USRDVM /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/*/	USRDVM /S/I/ /	USWTFM /S/I/ /
PRTS /S/D/*/	USWB /S/I/ /	USWTFV /S/I/ /
PTMS /S/D/*/	USWBSM /S/I/ /	USWTSM /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/
COPYSF /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/ /	TEKTRNX/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/	RECADD /P/P/P/
COPYR /M/ /R/	COPYSEL/M/U/U/	RECDELE/P/P/P/
COPYRE /M/U/U/	COPYSF /M/ /R/	RECGET /P/P/P/
COPYRM /M/ /R/	CVT360 /M/ /R/	RECREPL/P/P/P/

K2 INTERNAL-TO-INTERNAL (RELOCATION)

GETPA /S/N/*/	MSET /3/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/ /R/	TRANPAK/P/P/P/	UPDREPL/P/P/P/
CRINDEX/P/P/P/	UPDADD /P/P/P/	
DOCUMNT/M/U/U/	UPDDELE/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/ /R/	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/ /	SSORTF /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/
CONTRCT/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/	SCOPE /M/ /R/

N0 DEBUGGING

ALTIME /S/N/N/	MONERR /S/F/ /
ELTIME /S/N/N/	PRTIME /S/N/N/

N1 TRACING 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/

Q1 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/	DOCDOC /P/P/P/	PAGEPRT/M/U/U/
CCLIB /P/P/P/	LINERL /M/U/U/	PRODOC /P/P/P/
CCRM /M/U/U/	LISTCMP/M/U/U/	RECDOC /P/P/P/
CCRM /P/P/P/	LISTEOI/M/U/U/	TIDBITS/P/P/P/
COPYEXT/M/U/U/	LISTZ /M/U/U/	UPDDOC /P/P/P/
COPYRE /M/U/U/	LIST1 /M/U/U/	
COPYSEL/M/U/U/	LIST2 /M/U/U/	

P0 DIAGNOSTICS (HARDWARE MALFUNCTION)

VERTST /S/I/ /		

Q0 SERVICE OR HOUSEKEEPING, PROGRAMMING AIDS

AC /S/N/N/	IDID /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/
BDT /P/P/P/	LINER /M/U/U/	WHATLIB/M/U/U/
DFDATIM/M/U/U/	LINERL /M/U/U/	WHATLIB/P/P/P/
ELTIME /S/N/N/	MACHINE/S/N/N/	WHICHMF/M/U/U/
FTNRFL /S/N/N/	MFX /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/	PFRC /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.

OBUTIL /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/
DOCDELE/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/	MTDOC /M/U/U/	UNDOCIT/M/U/U/
DOCLIST/P/P/P/	PFDOC /M/U/U/	

Q7 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/
DECKLST/M/U/U/	PROGET /P/P/P/	UPDGETT/P/P/P/
DEKSORT/M/U/U/	PROGRAM/P/P/P/	UPDLIST/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/*/	

R3 LTST 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

FFPDR2 /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.

BMD01D		SIMPLE DATA DESCRIPTION
BMD02D		CORRELATION WITH TRANSGENERATION
BMD03D	*	CORRELATION WITH ITEM DELETION
BMD04D		ALPHANUMERIC FREQUENCY COUNT
BMD05D	*	GENERAL PLOT INCLUDING HISTOGRAM
BMD06D		DESCRIPTION OF STRATA
BMD07D		DESCRIPTION OF STRATA WITH HISTOGRAMS
BMD08D		CROSS-TABULATION WITH VARIABLE STACKING
BMD09D		CROSS-TABULATION, INCOMPLETE DATA
BMD10D		DATA PATTERNS FOR DICHOTOMIES
BMD11D		DATA PATTERNS FOR POLYCHOTOMIES
BMD12D		ASYMMETRIC CORRELATION WITH MISSING DATA
BMD13D		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		AUTOCOVARIANCE 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

*** BIMEDP ***

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

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

BMDP1D	SIMPLE DATA DESCRIPTION
BMDP2D	FREQUENCY COUNT ROUTINE
BMDP3D	T TEST AND T-SQUARED ROUTINE
BMDP4D	ALPHANUMERIC FREQUENCY COUNT ROUTINE
BMDP5D	UNIVARIATE PLOTTING
BMDP6D	BIVARIATE PLOTTING
BMDP7D	DESCRIPTION OF STRATA WITH HISTOGRAMS AND ANALYSIS OF VARIANCE
BMDP8D	MISSING VALUE CORRELATION
BMDP9D	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 BIMED 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
ANOVA	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	JORESKOG FACTOR ANALYSIS FOR GENERALIZED LEAST SQUARES, MAXIMUM LIKELIHOOD, AND UNWEIGHTED LEAST SQUARES
MANOVA	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:

AUDSORT	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 MODIFICATONS (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

DECKLST 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

DFDATIM PUT DATE/TIME IN DAYFILE

DMPFIL 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

HEXDMP DUMP 9-TRACK TAPE IN HEXADECIMAL FORMAT

JOBTIME 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)

LISTBIN 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

PFDOC CREATE PERMANENT FILE DOCUMENTATION

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

PROMNT 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 OLDPL IF COPYBF WAS USED ERRONEOUSLY. (2 PAGES)

COPYF * — 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):

ARLNALG - 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>.
LDSET,LIB=<LIB>.          OR        LIBRARY,<LIB>.
LGO.                      OR OTHER LOAD AND EXECUTE CARD(S)
```

FOR EXAMPLE,

```
JOBNAME.
CHARGE,....
FTN.
ATTACH,NSRDC.
LDSET,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
ORTHO2	ORTHOGONAL TRANSFORMATION OF A GENERAL M BY N MATRIX A TO UPPER TRIANGULAR FORM AND THE SOLUTION OF THE ASSOCIATED LINEAR LEAST SQUARES PROBLEM
QZABX	SOLUTION OF THE GENERALIZED MATRIX EIGENVALUE PROBLEM USING THE QZ ALGORITHM
REBAKA	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
RNQL1	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 FACTORIALLY 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

DSCRIM 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
HGROUP	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
MDRS	MISSING-DATA INTERCORRELATION
PCDS	PUNCH OUTPUT OF AN ARRAY
PRBF	CHANCE PROBABILITY OF AN F-RATIO
PRTS	PRINT OUTPUT OF AN ARRAY
REGRAN	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
TDPS	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)
VDRS	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
BQR	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
CINVIT	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
CORTB	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
HTRIBK	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY HTRIDI
HTRIB3	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
IMTQLV	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
IMTQL1	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
IMTQL2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX
INVIT	DETERMINE THOSE EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES

MINFIT	COMPUTE THE SINGLUAR VALUE DECOMPOSITION OF AN ARBITRARY REAL RECTANGULAR MATRIX AND THE SOLUTION OF A RELATED LINEAR LEAST SQUARES PROBLEM
ORTBAK	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
QZHES	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
QZIT	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
QZVAL	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
QZVEC	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
RATQR	DETERMINE SOME EXTREME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
REBAKB	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
RGG	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL GENERAL GENERALIZED EIGENPROBLEM A*X = (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
RT	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A CERTAIN REAL TRIDIAGONAL MATRIX
SVD	COMPUTE THE SINGULAR VALUE DECOMPOSITION OF AN ARBITRARY REAL RECTANGULAR MATRIX
TINVIT	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 EIENVALUES 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
TRED1	REDUCE A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS
TRED2	RETURN A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX ACCUMULATING THE ORTHOGONAL TRANSFORMATIONS
TRED3	REDUCE A REAL SYMMETRIC MATRIX, STORED AS A ONE-DIMENSIONAL ARRAY, TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS
TRIDIB	DETERMINE SOME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
TSTURM	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:

BESI0	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, I0(X)
BESEI0	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, EXP(-ABS(X))*I0(X)
BESI1	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, I1(X)
BESEI1	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, EXP(-ABS(X))*I1(X)
BESJ0	FUNCTION TO CALCULATE BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, J0(X)
BESJ1	FUNCTION TO CALCULATE BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, J1(X)
BESK0	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ZERO, K0(X), FOR REAL, POSITIVE X
BESEK0	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ZERO, EXP(X)*K0(X), FOR REAL, POSITIVE X
BESK1	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ONE, K1(X), FOR REAL, POSITIVE X
BESEK1	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ONE, EXP(X)*K1(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)
ELIK1	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, K(CAY**2)
ELIKM	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, K(1-ETA)
EI	COMPUTE EXPONENTIAL INTEGRAL, EI(X)
EONE	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-PARAMETIC, 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
ACRDAN	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
BECOVM	CALCULATE MEANS AND VARIANCE-COVARIANCE MATRIX
BECTR	ESTIMATE RHO 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
BEGRPS	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

BEMTRY 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)

BEMTRO 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)

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

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

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

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

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

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

BEPATS 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

BEPETN 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)=X0
DBCEVU	BICUBIC SPLINE MIXED PARTIAL DERIVATIVE EVALUATOR
DBCGDU	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
DCSGDU	INTEGRATE A CUBIC SPLINE BETWEEN LIMITS A AND B
DREBS	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
EBBCKC	BACKTRANSFORM THE EIGENVECTORS OF A BALANCED COMPLEX GENERAL MATRIX
EBBCKF	BACKTRANSFORM EIGENVECTORS OF A BALANCED MATRIX
EHBCKF	BACKTRANSFORM THE EIGENVECTORS OF THE UPPER HESSENBERG MATRIX FOUND IN EHESSF
EHBCKH	BACKTRANSFORM THE EIGENVECTORS OF A REAL SYMMETRIC TRIDIAGONAL MATRIX OBTAINED FROM A HERMITIAN MATRIX
EHESSC	REDUCTION OF A COMPLEX MATRIX TO COMPLEX UPPER HESSENBERG FORM

EHESSF	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
EHOUSH	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=LAMBDA*B*X WHERE A AND B ARE COMPLEX MATRICES OF ORDER N
EIGZF	CALCULATE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A SYSTEM A*X=LAMBDA*B*X WHERE A AND B ARE REAL MATRICES OF ORDER N
ELRH1C	COMPUTATION OF ALL EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX
ELRH2C	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=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
EQRH3F	FIND THE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX
EQRT1S	COMPUTE THE SMALLEST EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX USING THE QR ALGORITHM
EQRT2S	FIND THE EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A TRIDIAGONAL MATRIX, T, USING THE QL METHOD

EQRT3S GIVEN A TRIDIAGONAL MATRIX T, FIND M AND LAMDA(I),I=1,...,M WHERE M IS THE SMALLEST INTEGER SUCH THAT ABS(LAMDA(1))+...+ 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 QZ 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=LAMBDA*B*Z WHERE A IS QUASI-UPPER TRIANGULAR AND B IS UPPER TRIANGULAR

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

FFRQR2 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 ZSYSTM (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
FTPDIF	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.
GGBIN	GENERATE ONE BINOMIAL PSEUDO RANDOM DEVIATE
GGBNB	GENERATE NEGATIVE BINOMIAL PSEUDO-RANDOM DEVIATES
GGBTA	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
GGEOM	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 X = 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

GGPOSR 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
GTD2T	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
GTPOK	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

IBCIEU BICUBIC SPLINE TWO-DIMENSIONAL INTERPOLATOR

ICSEVU EVALUATION OF A CUBIC SPLINE

ICSFKU LEAST SQUARES APPROXIMATION BY CUBIC SPLINES - FIXED KNOTS

ICSICU INTERPOLATORY APPROXIMATION BY CUBIC SPLINES WITH ARBITRARY SECOND DERIVATIVE END CONDITIONS

ICSMOU 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

LEQ1PB LINEAR EQUATION SOLVER - SYMMETRIC BAND STORAGE MODE - SPACE ECONOMIZER SOLUTION

LEQ1S 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
LLSQAR	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
LUELMF	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
LUREFF	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
MDBETA	INCOMPLETE BETA PROBABILITY DISTRIBUTION FUNCTION

MDBFTI	INVERSE INCOMPLETE BETA PROBABILITY DISTRIBUTION FUNCTION
MDBIN	BINOMIAL PROBABILITY DISTRIBUTION FUNCTION
MDBNOR	BIVARIATE NORMAL PROBABILITY DISTRIBUTION FUNCTION
MDCH	CHI-SQUARED PROBABILITY - NON-INTEGER DEGREES OF FREEDOM
MDCHI	INVERSE CHI-SQUARED PROBABILITY DISTRIBUTION FUNCTION
MDFD	F PROBABILITY DISTRIBUTION FUNCTION
MDFDRE	F PROBABILITY DISTRIBUTION FUNCTION
MDFI	INVERSE F PROBABILITY DISTRIBUTION FUNCTION
MDGAM	INCOMPLETE GAMMA PROBABILITY DISTRIBUTION FUNCTION
MDHYP	HYPERGEOMETRIC PROBABILITY DISTRIBUTION
MDNOR	EVALUATE THE NORMAL (0,1) PROBABILITY DISTRIBUTION FUNCTION (ENTRY IN MERF)
MDPOS	CUMULATIVE PROBABILITY FROM THE POISSON DISTRIBUTION FUNCTION (ENTRY IN MDTPOS)
MDSMR	KOLMOGOROV-SMIRNOV STATISTICS ASYMPTOTIC DISTRIBUTION FUNCTION VALUES
MDSTI	INVERT A MODIFICATION OF THE STUDENTS T DISTRIBUTION
MDTD	STUDENT'S T DISTRIBUTION
MDTN	NON-CENTRAL T PROBABILITY DISTRIBUTION FUNCTION
MDTNF	INTEGRATE T(Y,Z) FOR NON-CENTRAL T USAGE
MDTPOS	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)
MMBSI0	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
MMKELD	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
MDNRIS	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 NBSD)
NBSIGN	SIGN TEST
NDMPLE	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 NDMPLE AT A POINT Y
NHFXT	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
NMKSF	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
OFCOEF	COMPUTE A MATRIX OF FACTOR SCORE COEFFICIENTS FOR INPUT TO IMSL ROUTINE OFSCOR
OFCOMM	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
OFIMA3	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
OFPSI	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
OPPINC	OBTAIN THE PRINCIPAL COMPONENTS OF AN M VARIATE SAMPLE OF OBSERVATIONS
OTMLNR	MAXIMUM LIKELIHOOD ESTIMATION FROM GROUPED AND CENSORED NORMAL DATA
RLCOMP	GENERATE THE INDEPENDENT VARIABLE SETTINGS FOR AN ORTHOGONAL CENTRAL COMPOSITE DESIGN, GIVEN THE MINIMUM AND MAXIMUM VALUE FOR EACH VARIABLE
RLDCQM	DECODE A QUADRATIC REGRESSION MODEL
RLDCVA	COMPUTE VARIANCES OF DECODED ORTHOGONAL POLYNOMIAL REGRESSION COEFFICIENTS
RLDCW	VARIANCES OF CODED ORTHOGONAL POLYNOMIAL REGRESSION COEFFICIENTS FOR USAGE ONLY IN CONJUNCTION WITH IMSL ROUTINES RLFOTH AND RLFOTW, AND PROVIDED TO PREPARE INPUT FOR IMSL ROUTINE RLOCVA
RLDOPM	DECODE AN ORTHOGONAL POLYNOMIAL REGRESSION MODEL
RLEAP	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

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

RLFOR 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

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

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

RLINFE 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-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-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
RSMITZ	FIT THE NON-LINEAR REGRESSION MODEL Y(I) = ALPHA + BETA*GAMMA**X(I) + E(I)
RSMSSE	COMPUTE THE ERROR SUM OF SQUARES FOR THE MODEL Y(I) = ALPHA + BETA*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
SSRAND	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
USCROM	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
USMNMX	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
USRDM	READ A MATRIX
USRDV	READ A VECTOR
USRDVM	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
VABMXS	FIND THE MAXIMUM ABSOLUTE VALUE OF THE ELEMENTS OF A ROW (OR COLUMN) OF A MATRIX STORED IN SYMMETRIC STORAGE MODE
VABSMF	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
VCVTBF	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

VCVTQF STORAGE MODE CONVERSION - BAND SYMMETRIC TO FULL STORAGE MODE

VCVTQS STORAGE MODE CONVERSION - BAND SYMMETRIC TO SYMMETRIC

VCVTSF 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

VIPRFF 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
VMULCF	MULTIPLICATION OF A BAND SYMMETRIC MATRIX STORED IN BAND SYMMETRIC STORAGE MODE BY A FULL MATRIX STORED IN FULL STORAGE MODE
VMULCQ	MULTIPLICATION OF TWO MATRICES STORED IN BAND SYMMETRIC STORAGE MODE
VMULCS	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
VNRMFI	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)

VUAFQ 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
ZSYSTM	DETERMINATION OF A ROOT OF A SYSTEM OF N SIMULTANEOUS NONLINEAR EQUATIONS IN N UNKNOWNS, 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
ZXSSQ	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*X SUBJECT TO A*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 POYLNOMIALS
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
BDCWNP	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
BESNIS	EVALUATE A TABLE FOR THE BESSEL FUNCTION I(X) FOR N=0,1,2,3,...,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

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

BLESCM 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

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

BPDSFB SOLVE LY=B AND LTX=Y BY BACK SUBSTIUTIONS - 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 BCHSDC

BPDSOM 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,...,I

BSUBHT 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**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-BAR=B-BAR IN THE LEAST SQUARES SENSE, IF NO EXACT SOLUTION EXISTS - A, B-BAR, X-BAR ARE COMPLEX

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

CDERIV 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 CDECOM

CFCME 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

CHIDST 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

CHSQC 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

CINPRD 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 CODECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

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

CMPYR 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

COMCUB 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

CORCOV 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.

CQDIV DIVIDE THE COMPLEX POLYNOMIAL BY THE QUADRATIC EXPRESSION (X**2+B*X+C), B AND C COMPLEX

CREV 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

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

DSCRP2 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
EIGCO1	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
EIGIMP	REFINE THE EIGENVECTORS OBTAINED FROM SUBROUTINE EIGVCH (WIELANDT INVERSE ITERATION)
EIGSYM	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 INTEGRAMS 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
FCGM2	SOLVE THE RECTANGULAR EQUATION SYSTEM AX-BAR=B-BAR 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 <= 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)

FLSQFY 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

FMVX 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
GITREM	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES WITH ITERATIVE REFINEMENT
GITRES	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SODE WITH ITERATIVE REFINEMENT
GLESOM	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES
GLESOS	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
HELP	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

INPPRD 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 INTERATIVE 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 INTERATIVE 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 OBTANED FROM THE SUBROUTINE BSUBHT

ITRPDM 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 APE 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

ITRPDS 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

LAGDIF 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

LESWNE 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 ITERRATIVE 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
NRMND	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

NRSG 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

OP1RAY 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

PADE APPROXIMATE FUNCTIONS WHICH HAVE MACLAURIN SERIES EXPANSIONS BY RATIONAL FUNCTIONS USING PADE 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 FVOM 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

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

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

PDSFBM 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

PFDIST 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

PIFDIS 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

PILGNM 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 BIMONIAL 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

PIRAYL 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 = X0 FROM A POPULATION HAVING AN EXPONENTIAL DISTRIBUTION

PRBUNF DETERMINE THE PROBABILITY OF OBTAINING A VARIABLE HAVING VALUE = X0 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

PRONY 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

PTRNRM 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-ITERATON 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 BAY=LAMBDAY OR YTAB=LAMBDAYT, WHERE A, B ARE REAL, SYMMETRIC AND B IS POSITIVE DEFINITE

REDSYS1 REDUCE THE EIGENPROBLEM (A-LAMBDAB)X=0 TO A STANDARD SYMMETRIC PROBLEM (P-LAMBDAI)Z=0 - A MUST BE REAL SYMMETRIC, B MUST BE REAL SYMMETRIC POSITIVE DEFINITE TO ALLOW THE DECOMPOSITION B=LLT

REDSYS2	REDUCE TO STANDARD FORM THE EIGENPROBLEMS (AB-LAMBDAI)X=0 OR (BA-LAMBDAI)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
RONWT	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, RQNWT SOLVED ALL 40)
RUNSAB	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-BAR 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
SMOCUB	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
SPDFBM	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
SPDSOS	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
SUBDIA	REDUCE A COMPLEX MATRIX TO UPPER HESSENBERG FORM BY SIMILARITY TRANSFORMATIONS, USING UNITARY MATRICES
SUBDIR	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

SYMQR	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
TRDFBM	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
TRLOIN	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 ZEROS 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
APOWR	EXPONENTIATION OF POWER SERIES - ONE VARIABLE
ARDCET	PROPERITES 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
BESSI	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 ELIMINTAION
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
CONTRCT	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 RM FILE INFORMATION TABLE (FIT)
DPROOT	FIND ALL ROOTS OF A REAL DOUBLE PRECISION PLOYNOMIAL
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)
DUMPFL	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
EXTERM	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 COC WORD)
FFT	FAST FOURIER TRANSFORM FOR COMPLEX TABULATED FUNCTION
FFTS	FAST FOURIER TRANSFORM
FGI	FORTRAN 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
FNCL3	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)
FTNREL	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
GETLFNS	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
HERE	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)
IPAKLFT	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 ORIGIN (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)
MFX	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
PERC	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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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
RANNUM	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
SEMICO	REPLACE DISPLAY CODE 00B WITH 77B (SEMI-COLON)
SENT	MOVE WORDS FROM ONE ARRAY 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
SNCNON	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
VALDAT	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 ARRAY 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 00B 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 ARRAY FOR 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
CCRM	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. BINDEX 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, DOCFILE, DOCGET, DOCLIST, DOCREPL
DOCFILE	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
GRIPE	ALLOW USER TO MAKE GRIPES OR SUGGESTIONS DIRECTLY TO THE COMPUTER
LIBSET1/2	CREATE SIMPLE ABSOLUTE USING ONE/TWO EDITLIB LIBRARY(IES)
LINE8/6	SET PRINT FILE TO 8/6 LINES PER INCH
MEX	TELL USER THE MAINFRAME ON WHICH HE IS RUNNING
MNSRDC	EXECUTE A PROGRAM ON EDITLIB USER LIBRARY 'MNSRDC'
MYPRC	EXECUTE A PROCEDURE ON FILE 'PROFIL' CATALOGED UNDER ANY ID
NOGO	CREATE SIMPLE ABSOLUTE FROM RELOCATABLE
NOREPUN	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
RECDOC	LIST DOCUMENTATION FOR PROCEDURES RECADD, RECDELE, RECDOC, 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
RUNBAS	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)
RUNMNF	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)
SELDUMP	CREATE BACKUP DUMP TAPE OF USER PERMANENT FILES OF AN ACCOUNT NUMBER
SELLOAD	RESTORE SELECTED ROUTINES FROM A BACKUP DUMPF TAPE
SEND	SEND MESSAGES TO AN INTERCOM USER WHO IS NOT LOGGED IN; LIST MESSAGES
STRUCT	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
TIDBITS	LIST FILE OF TIDBITS (HINTS ON IMPROVED COMPUTER USAGE)
TRANPAK	COPY CONTENTS FROM ONE DEVICE SET TO ANOTHER FOR BACKUP

UPDADD	ADD ONE DECK TO AN UPDATE LIBRARY
UPDDELE	DELETE ONE DECK FROM AN UPDATE LIBRARY
UPDDOC	LIST DOCUMENTATION FOR PROCEDURES UPDADD, UPDDELE, UPDDOC, UPDGET, UPDLIST, UPDREPL
UPDGET	EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,C) AND, OPTIONALLY, ADD EDITOR SEQUENCING
UPDGETS	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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