


```

MM      MM      TTTTTTTTTT  HH      HH      CCCCCCCC  EEEEEEEEEEE  XX      XX      PPPPPPPP
MM      MM      TTTTTTTTTT  HH      HH      CCCCCCCC  EEEEEEEEEEE  XX      XX      PPPPPPPP
MMM     MMM     TT          HH      HH      CC          EE          XX      XX      PP          PP
MMM     MMM     TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HHHHHHHHHH  CC          EE          XX      XX      PPPPPPPP
MM      MM      TT          HHHHHHHHHH  CC          EE          XX      XX      PPPPPPPP
MM      MM      TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HH      HH      CC          EE          XX      XX      PP          PP
MM      MM      TT          HH      HH      CCCCCCCC  EEEEEEEEEEE  XX      XX      PP          PP
MM      MM      TT          HH      HH      CCCCCC  C  EEEEEEEEEEE  XX      XX      PP          PP

```

```

LL      IIIIII  SSSSSSSS
LL      IIIIII  SSSSSSSS
LL      II      SS
LL      II      SS
LL      II      SS
LL      II      SS
LL      II      SSSSSS
LL      II      SSSSSS
LL      II      SS
LL      II      SS
LL      II      SS
LL      II      SS
LLLLLLLLLLLL IIIIII  SSSSSSSS
LLLLLLLLLLLL IIIIII  SSSSSSSS

```

(2)	49	HISTORY	; Detailed Current Edit History
(3)	58	DECLARATIONS	
(4)	86	MTH\$CEXP	- perform COMPLEX exponentiation

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```

0000 1 .TITLE MTHSCEXP COMPLEX EXPONENTIATION
0000 2 .IDENT /1-002/ ; File: MTHCEXP.MAR
0000 3
0000 4
0000 5 :*****
0000 6 :*
0000 7 : COPYRIGHT (c) 1978, 1980, 1982, 1984 BY *
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0000 24 :*
0000 25 :*
0000 26 :*****
0000 27 :
0000 28 :
0000 29 : FACILITY: MATH LIBRARY
0000 30 :++
0000 31 : ABSTRACT:
0000 32 : Perform complex exponentiation: e**(r,i)
0000 33 :
0000 34 :
0000 35 :--
0000 36 :
0000 37 : VERSION: 0
0000 38 :
0000 39 : HISTORY:
0000 40 :
0000 41 : AUTHOR:
0000 42 : Jonathan M. Taylor, 19-JUL-77: Version 0
0000 43 :
0000 44 : MODIFIED BY:
0000 45 :
0000 46 :
0000 47 :

```

MTH\$CEXP
1-002

COMPLEX EXPONENTIATION L 2 16-SEP-1984 01:08:09 VAX/VMS Macro V04-00
HISTORY ; Detailed Current Edit History 6-SEP-1984 11:20:59 [MTHRTL.SRC]MTHCEXP.MAR;1

Page 2
(2)

MTH
Tab

```
0000 49 .SBTTL HISTORY ; Detailed Current Edit History
0000 50
0000 51
0000 52 ; Edit History for Version 0 of MTH$CEXP
0000 53 :
0000 54 : 1-001 - Update version number and copyright notice. The last edit
0000 55 : number for version 0 was 4. JBS 16-NOV-78
0000 56 : 1-002 - Add "_" to the PSECT directive. JBS 21-DEC-78
```

```
0000 58 .SBTTL DECLARATIONS
0000 59
0000 60 :
0000 61 : INCLUDE FILES:
0000 62 : OERR.MAR
0000 63 :
0000 64 :
0000 65 : EXTERNAL SYMBOLS:
0000 66 : .GLOBL MTH$SIN_R4
0000 67 : .GLOBL MTH$COS_R4
0000 68 : .GLOBL MTH$EXP_R4
0000 69 :
0000 70 :
0000 71 : MACROS:
0000 72 : NONE
0000 73 :
0000 74 :
0000 75 : PSECT DECLARATIONS:
0000 76 : .PSECT _MTH$CODE PIC, SHR, LONG, EXE, NOWRT
0000 77 :
0000 78 :
0000 79 : EQUATED SYMBOLS:
00000004 0000 80 : argadr = 4 ; offset from AP of arg adr
0000 81 :
0000 82 :
0000 83 : OWN STORAGE:
0000 84 : NONE
```

```

0000 86      .SBTTL MTH$CEXP - perform COMPLEX exponentiation
0000 87
0000 88      :++
0000 89      : FUNCTIONAL DESCRIPTION:
0000 90
0000 91      : The result of the operation e ** (r, i) is computed
0000 92      : by:
0000 93
0000 94      : result = (EXP(r) * COS(i), EXP(r) * SIN(i))
0000 95
0000 96      : CALLING SEQUENCE:
0000 97      : Exponential.wfc.v      = MTH$CEXP(arg.rfc.r)
0000 98
0000 99
0000 100     : INPUT PARAMETERS:
0000 101     : The one input parameter is the address of COMPLEX number (r, i),
0000 102     : where r and i are both single-precision floating point values.
0000 103
0000 104     : IMPLICIT INPUTS:
0000 105     : NONE
0000 106
0000 107     : OUTPUT PARAMETERS:
0000 108     : NONE
0000 109
0000 110     : IMPLICIT OUTPUTS:
0000 111     : NONE
0000 112
0000 113     : COMPLETION CODES:
0000 114     : NONE
0000 115
0000 116     : SIDE EFFECTS:
0000 117     : Signals:      MTH$_SINSIGLOS if |i| > 2*PI*2**31.
0000 118     : Floating Overflow if r > 88.028
0000 119
0000 120     :--
0000 121
0000 122
00FC 0000 123     .ENTRY MTH$CEXP,      ^M<R2,R3,R4,R5,R6,R7>
0002 124     MTH$FLAG_JACKET      ; resignal
0C02
6D 00000000'GF 9E 0002     MOVAB  G^MTH$$JACKET_HND, (FP)
0009     ; set handler address to jacket
0009     ; handler
0009
0009 125
50 04 BC DO 0009 126     MOVL  @argadr(AP), R0      ; R0 = r
00000000'EF 16 000D 127     JSB   MTH$EXP_R4          ; R0 = EXP(r)
55 50 DO 0013 128     MOVL  R0, R5             ; R5 = EXP(r)
0016 129
56 04 AC DO 0016 130     MOVL  argadr(AP), R6      ; R6 -> (r, i)
001A 131
50 04 A6 DO 001A 132     MOVL  4(R6), R0          ; R0 = i
00000000'EF 16 001E 133     JSB   MTH$SIN_R4          ; R0 = SIN(i)
57 50 DO 0024 134     MOVL  R0, R7             ; R7 = SIN(i)
0027 135
50 04 A6 DO 0027 136     MOVL  4(R6), R0          ; R0 = i
00000000'EF 16 002B 137     JSB   MTH$COS_R4          ; R0 = COS(i)

```

MTH\$CEXP
1-002

COMPLEX EXPONENTIATION
MTH\$CEXP - perform COMPLEX exponentiatio

B 3

16-SEP-1984 01:08:09
6-SEP-1984 11:20:59

VAX/VMS Macro V04-00
[MTHRTL.SRC]MTH\$CEXP.MAR;1

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(4)

MTH
1-(

51	50	55	44	0031	138						
	55	57	45	0031	139	MULF	R5, R0		:	R0 = COS(i) * EXP(r)	
			04	0034	140	MULF3	R7, R5, R1		:	R1 = SIN(i) * EXP(r)	
				0038	141	RET					
				0039	142						
				0039	143						
				0039	144	.END					

MTH\$EXP
Symbol table

COMPLEX EXPONENTIATION

C 3

16-SEP-1984 01:08:09
6-SEP-1984 11:20:59

VAX/VMS Macro V04-00
[MTHRTL.SRC]MTH\$EXP.MAR;1

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(4)

MTH
1-(

```

ARGADR          = 00000004
MTH$$JACKET_HND ***** X 01
MTH$EXP         00000000 RG 01
MTH$COS_R4      ***** G 00
MTH$EXP_R4      ***** G 00
MTH$$IN_R4      ***** G 00

```

```

+-----+
! Psect synopsis !
+-----+

```

PSECT name	Allocation	PSECT No.	Attributes
ABS	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
_MTH\$CODE	00000039 (57.)	01 (1.)	PIC USR CON REL LCL SHR EXE RD NOWRT NOVEC LONG

```

+-----+
! Performance indicators !
+-----+

```

Phase	Page faults	CPU Time	Elapsed Time
Initialization	29	00:00:00.10	00:00:00.72
Command processing	133	00:00:00.65	00:00:06.10
Pass 1	78	00:00:00.58	00:00:02.56
Symbol table sort	0	00:00:00.00	00:00:00.00
Pass 2	42	00:00:00.50	00:00:01.93
Symbol table output	2	00:00:00.01	00:00:00.06
Psect synopsis output	2	00:00:00.01	00:00:00.01
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	288	00:00:01.87	00:00:11.39

The working set limit was 900 pages.
2308 bytes (5 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 6 non-local and 0 local symbols.
204 source lines were read in Pass 1, producing 11 object records in Pass 2.
1 page of virtual memory was used to define 1 macro.

```

+-----+
! Macro library statistics !
+-----+

```

Macro library name	Macros defined
_\$255\$DUA28:[SYSLIB]STARLET.MLB;2	0

0 GETS were required to define 0 macros.

There were no errors, warnings or information messages.

MACRO/ENABLE=SUPPRESSION/DISABLE=(GLOBAL,TRACEBACK)/LIS=LIS\$:MTH\$EXP/OBJ=OBJ\$:MTH\$EXP MSRC\$:MTH\$JACKET/UPDATE=(ENHS:MTH\$JACKET)+MSRC\$:

