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(2)	51
(3)	59
(4)	87
(5)	136
(6)	187

HISTORY ; Detailed Current Edit History
DECLARATIONS
MTH\$CGSIN - G COMPLEX*16 SINE
MTH\$CGCOS - G COMPLEX*16 Cosine
WORKER - do all the work

```
0000 1 .TITLE MTH$CGSINCOS G COMPLEX*16 Sine and Cosine
0000 2 .IDENT /1-002/ ; File: MTHCGSINC.MAR Edit: SBL1002
0000 3
0000 4
0000 5 *****
0000 6 *
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0000 24 *
0000 25 *
0000 26 *****
0000 27
0000 28
0000 29
0000 30 FACILITY: MATH LIBRARY
0000 31 ++
0000 32 ABSTRACT:
0000 33 Return the SINE of a G COMPLEX*16 number
0000 34 Return the COSINE of a G COMPLEX*16 number
0000 35
0000 36
0000 37 --
0000 38
0000 39 VERSION: 1
0000 40
0000 41 HISTORY:
0000 42
0000 43 AUTHOR:
0000 44 Steven B. Lionel, 26-July-1979
0000 45
0000 46 MODIFIED BY:
0000 47
0000 48
0000 49
```


MTH\$CGSINCOS
1-002

D 5
G COMPLEX*16 Sine and Cosine
HISTORY ; Detailed Current Edit History 16-SEP-1984 01:09:46 VAX/VMS Macro V04-00
6-SEP-1984 11:21:07 [MTHRTL.SRC]MTHCGSINC.MAR;1 Page 2
(2)

0000 51 .SBTTL HISTORY ; Detailed Current Edit History
0000 52
0000 53
0000 54 ; Edit History
0000 55
0000 56 : 1-001 - Adapted from MTH\$CSINCOS version 1-002. SBL 26-July-1979
0000 57 : 1-002 - Use MTH\$GEXP_R6. SBL 14-Dec-1979

MTH
Sym

ARG
MTH
MTH
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MTH
RES
RET
RET

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0000 59      .SBTTL  DECLARATIONS
0000 60
0000 61 :
0000 62 : INCLUDE FILES:
0000 63 :
0000 64 :
0000 65 :
0000 66 : EXTERNAL SYMBOLS:
0000 67      .DSABL  GBL
0000 68      .EXTRN  MTH$GSIN_R7
0000 69      .EXTRN  MTH$GCOS_R7
0000 70      .EXTRN  MTH$GEXP_R6
0000 71
0000 72 :
0000 73 : MACROS:
0000 74 :
0000 75 :
0000 76 :
0000 77 : PSECT DECLARATIONS:
0000 78      .PSECT  _MTH$CODE      PIC, SHR, LONG, EXE, NOWRT
0000 79
0000 80 :
0000 81 : EQUATED SYMBOLS:
0000 82 :
0000 83 :
0000 84 : OWN STORAGE:
0000 85 :      NONE

```



```
0000 87      .SBTTL MTH$CGSIN - G COMPLEX*16 SINE
0000 88
0000 89      :++
0000 90      : FUNCTIONAL DESCRIPTION:
0000 91      :
0000 92      : MTH$CGSIN computes the SINE of a G COMPLEX*16 number (r, i) as
0000 93      :
0000 94      : result = (SIN(r) * COSH(i), COS(r) * SINH(i))
0000 95      :
0000 96      : CALLING SEQUENCE:
0000 97      : CALL MTH$CGSIN (result.wgc.r, arg.rgc.r)
0000 98      :
0000 99      :
0000 100     : INPUT PARAMETERS:
0000 101     : arg      = 8                      ; G COMPLEX*16 argument by reference
0000 102     :
0000 103     : IMPLICIT INPUTS:
0000 104     : NONE
0000 105     :
0000 106     : OUTPUT PARAMETERS:
0000 107     :
0000 108     : result = 4                      ; G COMPLEX*16 result by reference
0000 109     :
0000 110     : IMPLICIT OUTPUTS:
0000 111     : NONE
0000 112     :
0000 113     : COMPLETION CODES:
0000 114     : NONE
0000 115     :
0000 116     : SIDE EFFECTS:
0000 117     : Signals:      Reserved Operand if r or i are invalid (-0.0)
0000 118     :                  MTH$ SINSIGLOS if |r| > 2*PI*2**31.
0000 119     :                  Floating Overflow if i > 88.028.
0000 120     :
0000 121     :--
0000 122
0000 123
0000 124     .ENTRY MTH$CGSIN,      ^M<R2,R3,R4,R5,R6,R7>
0002 125     JSB      WORKER      : R0-R1 = SIN(r)
0008 126     :                  : R2-R3 = COS(r)
0008 127     :                  : R4-R5 = SINH(i)
0008 128     :                  : R6-R7 = COSH(i)
0008 129     :                  : R0-R1 = SIN(r) * COSH(i)
000C 130     :                  : R2-R3 = COS(r) * SINH(i)
0010 131     :                  : get result address
0014 132     :                  : Store real part
0017 133     :                  : Store imaginary part
001A 134     RET
```

00000008 00FC 0000 124 .ENTRY MTH\$CGSIN, ^M<R2,R3,R4,R5,R6,R7>
00000008 0002 125 JSB WORKER : R0-R1 = SIN(r)
00000008 0008 126 : : R2-R3 = COS(r)
00000008 0008 127 : : R4-R5 = SINH(i)
00000008 0008 128 : : R6-R7 = COSH(i)
50 56 44FD 0008 129 : : R0-R1 = SIN(r) * COSH(i)
52 54 44FD 000C 130 : : R2-R3 = COS(r) * SINH(i)
54 04 AC D0 0010 131 : : get result address
84 50 7D 0014 132 : : Store real part
64 52 7D 0017 133 : : Store imaginary part
04 001A 134 RET

```
001B 136 .SBTTL MTH$CGCOS - G COMPLEX*16 Cosine
001B 137
001B 138 :++
001B 139 : FUNCTIONAL DESCRIPTION:
001B 140 :
001B 141 : MTH$CGCOS computes the COSINE of G COMPLEX*16 number (r, i) as follows:
001B 142 :
001B 143 : result = (COS(r) * COSH(i), -SIN(r) * SINH(-i))
001B 144 :
001B 145 : CALLING SEQUENCE:
001B 146 : CALL MTH$CGCOS (result.wgc.r, arg.rgc.r)
001B 147 :
001B 148 :
00000008 001B 149 : INPUT PARAMETERS:
001B 150 : arg = 8 ; G COMPLEX*16 argument by reference
001B 151 :
001B 152 : IMPLICIT INPUTS:
001B 153 : NONE
001B 154 :
001B 155 : OUTPUT PARAMETERS:
00000004 001B 156 :
001B 157 : result = 4 ; G COMPLEX*16 result by reference
001B 158 :
001B 159 : IMPLICIT OUTPUTS:
001B 160 : NONE
001B 161 :
001B 162 : COMPLETION CODES:
001B 163 : NONE
001B 164 :
001B 165 : SIDE EFFECTS:
001B 166 : Signals: Reserved Operand if r or i are invalid (-0.0)
001B 167 : MTH$_SINSIGLOS if |r| > 2*PI*2**31.
001B 168 : Floating Overflow if i > 88.028.
001B 169 :
001B 170 :--
001B 171
001B 172
0000003E'EF 00FC 001B 173 .ENTRY MTH$CGCOS, ^M<R2,R3,R4,R5,R6,R7>
16 001D 174 JSB WORKER
0023 175
0023 176
0023 177
56 52 44FD 0023 178 MULG2 R2, R6
50 50 52FD 0027 179 MNEGG R0, R0
52 54 50 45FD 002B 180 MULG3 R0, R4, R2
50 56 7D 0030 181 MOVQ R6, R0
54 04 AC D0 0033 182 MOVL result(AP), R4
84 50 7D 0037 183 MOVQ R0, (R4)+
64 52 7D 003A 184 MOVQ R2, (R4)
04 003D 185 RET
```



```
003E 187 .SBTTL WORKER - do all the work
003E 188
003E 189 ;+
003E 190 ; Setup error handler
003E 191 ; Compute:
003E 192 ; R0-R1 = SIN(r)
003E 193 ; R2-R3 = COS(r)
003E 194 ; R4-R5 = SINH(i)
003E 195 ; R6-R7 = COSH(i)
003E 196 ; -
003E 197
003E 198 WORKER:
003E 199 MTH$FLAG_JACKET ; set up error handler
003E
6D 00000000'GF 9E 003E MOVAB G^MTH$$JACKET_HND, (FP) ; set handler address to jacket
0045 ; handler
0045
0045 200 MOVL arg(AP), R0 ; R0 -> (r, i)
0049 201 MOVG 8(R0), R0 ; R0-R1 = i
004E 202 JSB MTH$GEXP R6 ; R0-R1 = EXP(i)
52 08 50 47FD 0054 203 DIVG3 R0, #1, R2 ; R2-R3 = EXP(-i)
0059 204
0059 205 SUBG3 R2, R0, R4 ; R4-R5 = EXP(i) - EXP(-i)
7E 54 00 45FD 005E 206 MULG3 #0.5, R4, -(SP) ; (SP) = SINH(i)
0063 207
0063 208 ADDG3 R2, R0, R4 ; R4-R5 = EXP(i) + EXP(-i)
7E 54 00 45FD 0068 209 MULG3 #0.5, R4, -(SP) ; (SP) = COSH(i)
006D 210
006D 211 MOVG @arg(AP), R0 ; R0-R1 = r
0072 212 JSB MTH$GCOS R7 ; R0-R1 = COS(r)
0078 213 MOVQ R0, -(SP) ; (SP) = COS(r)
007B 214
007B 215 MOVQ @arg(AP), R0 ; R0-R1 = r
007F 216 JSB MTH$GSIN R7 ; R0-R1 = SIN(r)
52 08 BC 7D 0085 217 MOVQ (SP)+, R2 ; R2-R3 = COS(r)
56 8E 7D 0088 218 MOVQ (SP)+, R6 ; R6-R7 = COSH(i)
54 8E 7D 008B 219 MOVQ (SP)+, R4 ; R4-R5 = SINH(i)
008E 220
008E 221 RSB
008F 222
008F 223
008F 224
008F 225 .END
```

MTH\$CGSINCOS
Symbol table

G COMPLEX*16 Sine and Cosine

I 5

16-SEP-1984 01:09:46
6-SEP-1984 11:21:07

VAX/VMS Macro V04-00
[MTHRTL.SRC]MTHCGSINC.MAR;1

Page 7
(6)

ARG = 00000008
MTH\$\$JACKET_HND ***** X 01
MTH\$CGCOS 0000001B RG 01
MTH\$CGSIN 00000000 RG 01
MTH\$GCOS_R7 ***** X 00
MTH\$GEXP_R6 ***** X 00
MTH\$GSIN_R7 ***** X 00
RESULT = 00000004
WORKER 0000003E R 01

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

PSECT name	Allocation	PSECT No.	Attributes
ABS	00000000 (0.)	00 (0.)	NOPIC USR
MTH\$CODE	0000008F (143.)	01 (1.)	PIC USR

CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
CON REL LCL SHR EXE RD NOWRT NOVEC LONG

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

Phase	Page faults	CPU Time	Elapsed Time
Initialization	37	00:00:00.11	00:00:00.88
Command processing	119	00:00:00.70	00:00:04.47
Pass 1	91	00:00:00.70	00:00:04.44
Symbol table sort	0	00:00:00.00	00:00:00.00
Pass 2	54	00:00:00.61	00:00:01.90
Symbol table output	2	00:00:00.02	00:00:00.02
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	307	00:00:02.15	00:00:11.72

The working set limit was 750 pages.
3610 bytes (8 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 9 non-local and 0 local symbols.
285 source lines were read in Pass 1, producing 14 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\$:MTHCGSINC/OBJ=OBJ\$:MTHCGSINC MSRC\$:MTHJACKET/UPDATE=(ENH\$:MTHJACKET)+MS

0258 AH-BT13A-SE
VAX/VMS V4.0

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