```
   6125                                 23940   ; STRATEGY:
   6126                                 23960   ;       NUMDIM=NUMBER OF DIMENSIONS
   6127                                 23980   ;       CURTOL=0
   6128                                 24000   ; INLPNM:GET A NEW INDICE
   6129                                 24020   ;       POP NEW MAX INTO CURMAX
   6130                                 24040   ;       MAKE SURE INDICE IS NOT TOO BIG
   6131                                 24060   ;       MUTLIPLY CURTOL BY CURMAX
   6132                                 24080   ;       ADD INDICE TO CURTOL
   6133                                 24100   ;       NUMDIM=NUMDIM-1
   6134                                 24120   ;       JNZ     INLPNM
   6135                                 24140   ;       USE CURTOL*4 (VALTYP FOR EXTENDED) AS OFFSET
   6136                                 24160   ;
   6137  007245' 001000  000043         24180   GETDEF: INX     H                       ;POINT PAST THE NUMBER OF DIMENSIONS
   6138  007246' 001000  000001         24200           LXI     B,$CODE                 ;CURTOL=ZERO
   6139  007247' 000000  000000'
   6140  007250' 000000  007243'
   6141  007251' 001000  000026         24220           XWD     ^O1000,^O26             ;"MVI D," AROUND THE NEXT BYTE
   6142  007252' 001000  000341         24240   INLPNM: POP     H                       ;[H,L]= POINTER INTO VARIABLE ENTRY
   6143  007253' 001000  000136         24260           MOV     E,M                     ;[D,E]=MAXIMUM FOR THE CURRENT INDICE
   6144  007254' 001000  000043         24280           INX     H
   6145  007255' 001000  000126         24300           MOV     D,M
   6146  007256' 001000  000043         24320           INX     H
   6147  007257' 001000  000343         24340           XTHL                            ;[H,L]=CURRENT INDICE
   6148                                 24360                                           ;POINTER INTO THE VARIABLE GOES ON THE STACK
   6149  007260' 001000  000365         24380           PUSH    PSW                     ;SAVE THE NUMBER OF DIMENSIONS
   6150  007261' 001000  000347         24400           COMPAR                          ;SEE IF THE CURRENT INDICE IS TOO BIG
   6151  007262' 001000  000322         24420           JNC     BSERR                   ;IF SO "BAD SUBSCRIPT" ERROR
   6152  007263' 000000  007077'
   6153  007264' 000000  007247'
   6154  007265' 001000  000345         24440           PUSH    H                       ;SAVE THE CURRENT INDICE
   6155  007266' 001000  000315         24460           CALL    UMULT                   ;CURTOL=CURTOL*CURRENT MAXIMUM
   6156  007267' 000000  007161*
   6157  007270' 000000  007263'
   6158  007271' 001000  000321         24480           POP     D                       ;INDICE INTO [D,E]
   6159  007272' 001000  000031         24500           DAD     D                       ;ADD THE INDICETO CURTOL
   6160  007273' 001000  000361         24520           POP     PSW                     ;GET THE NUMBER OF DIMENSIONS IN [A]
   6161  007274' 001000  000075         24540           DCR     A                       ;SEE IF ALL THE INDICES HAVE BEEN PROCESSED
   6162  007275' 001000  000104         24560           MOV     B,H                     ;[B,C]=CURTOL IN CASE WE LOOP BACK
   6163  007276' 001000  000115         24580           MOV     C,L
   6164  007277' 001000  000302         24600           JNZ     INLPNM                  ;PROCESS THE REST OF THE INDICES
   6165  007300' 000000  007252'
   6166  007301' 000000  007267'
   6167                                 24620   IFE     LENGTH-2,<
   6168  007302' 001000  000072         24640           LDA     VALTYP                  ;SEE HOW BIG THE VALUES ARE
   6169  007303' 000000  001543'
   6170  007304' 000000  007300'
   6171                                 24660                                           ;AND MULTIPLY BY THAT SIZE
   6172  007305' 001000  000104         24680           MOV     B,H                     ;SAVE THE ORIGINAL VALUE FOR MULTIPLYING
   6173  007306' 001000  000115         24700           MOV     C,L                     ;BY THREE
   6174  007307' 001000  000051         24720           DAD     H                       ;MULTIPLY BY TWO AT LEAST
   6175  007310' 001000  000326         24740           SUI     4                       ;FOR INTEGERS AND STRINGS
   6176  007311' 000000  000004
   6177                                 24760                                           ;NO MORE MULTIPLYING BY TWO
```

```
   6178  007312' 001000  000332         24780           JC      SMLVAL
   6179  007313' 000000  007322'
   6180  007314' 000000  007303'
   6181  007315' 001000  000051         24800           DAD     H                       ;NOW MULTIPLIED BY FOUR
   6182  007316' 001000  000312         24820           JZ      DONMUL                  ;IF SINGLE ALL DONE
   6183  007317' 000000  007326'
   6184  007320' 000000  007313'
   6185  007321' 001000  000051         24840           DAD     H                       ;BY EIGHT FOR DOUBLES
   6186  007322' 001000  000342         24860   SMLVAL: JPO     DONMUL                  ;FOR STRINGS
   6187  007323' 000000  007326'
   6188  007324' 000000  007317'
   6189  007325' 001000  000011         24880           DAD     B                       ;ADD IN THE ORIGINAL
   6190  007326'                          24900   DONMUL:>
   6191                                 24920   IFN     LENGTH-2,<
   6192                                 24940           DAD     H                       ;MULTIPLY CURTOL BY FOUR
   6193                                 24960           DAD     H>
   6194  007326' 001000  000301         24980           POP     B                       ;POP OFF THE ADDRESS OF WHERE THE VALUES
   6195                                 25000                                           ;BEGIN
   6196  007327' 001000  000011         25020           DAD     B                       ;ADD IT ONTO CURTOL TO GET THE
   6197                                 25040                                           ;PLACE THE VALUE IS STORED
   6198  007330' 001000  000353         25060           XCHG                            ;RETURN THE POINTER IN [D,E]
   6199  007331' 001000  000052         25080   FINNOW: LHLD    TEMP2                   ;REGET THE TEXT POINTER
   6200  007332' 000000  001605'
   6201  007333' 000000  007323'
   6202  007334' 001000  000053         25100           DCX     H                       ;REREAD THE TERMINATING CHARACTER
   6203  007335' 001000  000327         25120           CHRGET
   6204  007336' 001000  000311         25140           RET>
   6205
   6206                                 25180   PAGE
```

FORMULA EVALUATION

```
   6207                                 25200   SUBTTL FRE  FUNCTION AND INTEGER TO FLOATING  ROUTINES
   6208                                 25220   IFN     LENGTH,<
   6209  007337' 001000  000052         25240   FRE:    LHLD    STREND          ;GET END OF VARIABLE AND TEXT SPACE
   6210  007340' 000000  001625'
   6211  007341' 000000  007332'
   6212  007342' 001000  000353         25260           XCHG                    ;PUT IT IN [D,E] FOR SUBTRACTION
   6213  007343' 001000  000041         25280           LXI     H,$CODE         ;ZERO [H,L]
   6214  007344' 000000  000000'
   6215  007345' 000000  007340'
   6216  007346' 001000  000071         25300           DAD     SP              ;PUT THE STACK POINTER IN [H,L]
   6217                                 25320   IFN     STRING,<
   6218                                 25340   IFE     LENGTH-2,<
   6219  007347' 001000  000315         25360           CALL    GETYPE
   6220  007350' 000000  006307'
   6221  007351' 000000  007344'
   6222  007352' 001000  000302         25370           JNZ     GIVDBL>
   6223  007353' 000000  007372'
   6224  007354' 000000  007350'
   6225                                 25380   IFN     LENGTH-2,<
   6226                                 25400           LDA     VALTYP          ;WAS THE ARGUMENT A STRING?
   6227                                 25420           ORA     A
   6228                                 25440           JZ      GIVDBL>         ;NO, GIVE FREE VARIABLE SPACE
   6229  007355' 001000  000315         25460           CALL    FREFAC          ;FREE UP ARGUMENT AND SETUP
   6230  007356' 000000  010434'
   6231  007357' 000000  007353'
   6232                                 25480                                   ;TO GIVE FREE STRING SPACE
   6233  007360' 001000  000315         25500           CALL    GARBA2          ;DO GARBAGE COLLECTION
   6234  007361' 000000  010042'
   6235  007362' 000000  007356'
   6236  007363' 001000  000052         25520           LHLD    STKTOP          ;BOTTOM OF FREE AREA
   6237  007364' 000000  001615'
   6238  007365' 000000  007361'
   6239  007366' 001000  000353         25540           XCHG
   6240  007367' 001000  000052         25560           LHLD    FRETOP>>        ;TOP OF FREE AREA
   6241  007370' 000000  001573'
   6242  007371' 000000  007364'
   6243                                 25580   ;
   6244                                 25600   ; THIS ROUTINE SUBTRACTS [D,E] FROM [H,L]
   6245                                 25620   ; AND FLOATS THE RESULT LEAVING IT IN FAC.
   6246                                 25640   ;
   6247                                 25660   IFE     LENGTH-1,<
   6248                                 25680   GIVDBL: MOV     A,L             ;DO THE SUBTRACTION
   6249                                 25700           SUB     E
   6250                                 25720           MOV     C,A
   6251                                 25740           MOV     A,H
   6252                                 25760           SBB     D
   6253                                 25780   GIVACF: MOV     B,C>
   6254                                 25790   IFN     LENGTH-2,<
   6255                                 25800   GIVABF: MOV     D,B
   6256                                 25820           MVI     E,0             ;GET ZERO IN LOW
   6257                                 25840   IFN     STRING,<
   6258                                 25860           LXI     H,VALTYP        ;FLAG VALUE TYPE AS NUMERIC
   6259                                 25880           MOV     M,E>
```

```
   6260                                 25900           MVI     B,144           ;SETUP TO FLOAT [B,C]
   6261                                 25920           JMP     FLOATR>
   6262                                 26120   IFE     LENGTH-2,<
   6263  007372' 001000  000175         26140   GIVDBL: MOV     A,L             ;[H,L]=[H,L]-[D,E]
   6264  007373' 001000  000223         26160           SUB     E
   6265  007374' 001000  000157         26180           MOV     L,A
   6266  007375' 001000  000174         26200           MOV     A,H
   6267  007376' 001000  000232         26220           SBB     D
   6268  007377' 001000  000021         26240           XWD     ^O1000,^O21     ;SKIP THE NEXT TWO BYTES WITH "LXI D,"
   6269  007400' 001000  000157         26260   SNGFLT: MOV     L,A             ;MAKE [A] AN UNSIGNED INTEGER
   6270  007401' 001000  000257         26280           XRA     A
   6271  007402' 001000  000147         26300   GIVINT: MOV     H,A
   6272  007403' 001000  000303         26320           JMP     MAKINT>
   6273  007404' 000000  006471*
   6274  007405' 000000  007370'
   6275                                 26322   IFN     LENGTH,<
   6276                                 26324   IFN     LPTSW,<
   6277                                 26326   LPOS:   LDA     LPTPOS
   6278                                 26328           JMP     SNGFLT>
   6279  007406' 001000  000072         26330   POS:    LDA     TTYPOS          ;GET TELETYPE POSITION
   6280  007407' 000000  000047'
   6281  007410' 000000  007404'
   6282                                 26332   IFN     LENGTH-2,<
   6283                                 26334   SNGFLT: MOV     B,A             ;RETURN FLOATING 1 BYTE
   6284                                 26336           XRA     A               ;UNSIGNED FROM A
   6285                                 26338           JMP     GIVABF>>        ;GIVING 0-255
   6286
   6287                                 26360   PAGE
```

FORMULA EVALUATION

```
  6288                                  26380   SUBTTL  SIMPLE-USER-DEFINED-FUNCTION CODE
  6289                                  26390   IFN     FUNCTS,<
  6290                                  26400   ;
  6291                                  26420   ; NOTE ONLY SINGLE ARGUMENTS ARE ALLOWED TO FUNCTIONS
  6292                                  26440   ; AND FUNCTIONS MUST BE OF THE SINGLE LINE FORM:
  6293                                  26460   ; DEF FNA(X)=X^2+X-2
  6294                                  26480   ; NO STRINGS CAN BE INVOLVED WITH THESE FUNCTIONS
  6295
  6296                                  26520   ; IDEA: CREATE A FUNNY SIMPLE VARIABLE ENTRY
  6297                                  26540   ; WHOSE FIRST CHARACTER (SECOND WORD IN MEMORY)
  6298                                  26560   ; HAS THE 200 BIT SET.
  6299                                  26580   ; THE VALUE WILL BE:
  6300                                  26600   ;
  6301                                  26620   ;       A TXTPTR TO THE FORMULA
  6302                                  26640   ;       A PTR TO THE ARGUMENT VARIABLE
  6303                                  26660   ;
  6304                                  26680   ; FUNCTION NAMES CAN BE LIKE "FNA4"
  6305                                  26700   ;
  6306
  6307  007411' 001000  000315          26780   DEF:    CALL    GETFNM          ;GET A POINTER TO THE
  6308  007412' 000000  007550'
  6309  007413' 000000  007407'
  6310                                  26800                                   ;FUNCTION VARAIBLE
  6311  007414' 001000  000001          26820           LXI     B,DATA          ;EVENTUALLY RETURN TO "DATA"
  6312  007415' 000000  004072'
  6313  007416' 000000  007412'
  6314  007417' 001000  000305          26840           PUSH    B               ;AND SKIP THE FORMULA
  6315  007420' 001000  000325          26860           PUSH    D               ;SAVE A POINTER TO IT
  6316  007421' 001000  000315          26880           CALL    ERRDIR          ;DEF IS "ILLEGAL DIRECT"
  6317  007422' 000000  007532'
  6318  007423' 000000  007415'
  6319  007424' 001000  000317          26900           SYNCHK  "("             ;MUST HAVE "("
  6320  007425' 000000  000050
  6321                                  26920                                   ;SINCE WE STORE A TEXT POINTER
  6322  007426' 001000  000315          26940           CALL    PTRGET          ;GET POINTER TO ARGUMENT
  6323  007427' 000000  006505'
  6324  007430' 000000  007422'
  6325                                  26960   IFN     LENGTH-2,<
  6326                                  26980   IFN     STRING,<CALL    CHKNUM>>;STRINGS ILLEGAL
  6327  007431' 001000  000317          27000           SYNCHK  ")"             ;MUST CLOSE IT WITH ")"
  6328  007432' 000000  000051
  6329  007433' 001000  000317          27020           SYNCHK  EQULTK          ;MUST HAVE EQUAL
  6330  007434' 000000  000260
  6331  007435' 001000  000104          27040           MOV     B,H
  6332  007436' 001000  000115          27060           MOV     C,L
  6333  007437' 001000  000343          27080           XTHL                    ;PUT THE TXTPTR ON THE STACK
  6334                                  27100                                   ;[H,L]=PTR TO FUNCTION VARIABLE
  6335                                  27120                                   ;[B,C]=TXTPTR
  6336  007440' 001000  000303          27140           JMP     DEFFIN          ;PUT DOWN THE TEXT-POINTER
  6337  007441' 000000  007521'
  6338  007442' 000000  007427'
  6339                                  27160                                   ;AND ARGUMENT POINTER IN
  6340                                  27180                                   ;MEMORY, RESTORE THE TXTPTR
```

FORMULA EVALLATION

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  6341                                  27200                                   ;AND GO TO "DATA" SKIPPING THE
  6342                                  27220                                   ;REST OF THE FORMULA
  6343
  6344  007443' 001000  000315          27260   FNDOER: CALL    GETFNM          ;GET A POINTER TO
  6345  007444' 000000  007550'
  6346  007445' 000000  007441'
  6347                                  27280                                   ;THE FUNCTON DEFINITION IN [D,E]
  6348  007446' 001000  000325          27300           PUSH    D               ;SAVE THE POINTER
  6349  007447' 001000  000315          27320           CALL    PARCHK          ;EVALUATE THE VALUE TO BE PASSED
  6350  007450' 000000  006136'
  6351  007451' 000000  007444'
  6352                                  27340   IFN     LENGTH-2,<
  6353                                  27360   IFN     STRING,<CALL    CHKNUM>> ;ARG CANNOT BE STRING
  6354  007452' 001000  000343          27380           XTHL                    ;[H,L]=POINTER TO FUNCTION DEF
  6355                                  27400                                   ;TEXT POINTER GOES ON THE STACK
  6356  007453' 001000  000367          27420           PUSHM                   ;PUSH THE POINTER AT THE FORMULA
  6357                                  27440                                   ;ONTO THE STACK
  6358  007454' 001000  000321          27460           POP     D               ;[D,E]=PTR TO FORMULA
  6359  007455' 001000  000367          27480           PUSHM                   ;PUT A POINTER TO THE
  6360                                  27500                                   ;ARGUMENT ON THE STACK
  6361  007456' 001000  000341          27520           POP     H               ;[H,L]=POINTER TO ARG
  6362  007457' 001000  000367          27540           PUSHFM                  ;SAVE ARGS OLD VALUE ON THE STACK
  6363  007460' 001000  000367
  6364  007461' 001000  000053          27560           DCX     H
  6365  007462' 001000  000053          27580           DCX     H
  6366  007463' 001000  000053          27600           DCX     H               ;POINT TO FRONT OF ARG AGAIN
  6367  007464' 001000  000053          27620           DCX     H
  6368  007465' 001000  000345          27640           PUSH    H               ;SAVE IT
  6369  007466' 001000  000347          27660           COMPAR                  ;SHOULDN'T BE EQUAL UNLESS
  6370                                  27680                                   ;FUNCTION WAS NEVER DEFINED
  6371  007467' 001000  000325          27700           PUSH    D               ;SAVE FORMULA TEXT POINTER
  6372  007470' 001000  000036          27720           MVI     E,ERRUF         ;NOW [D,E] FREE SO CHECK IF (ZERO) SET
  6373  007471' 000000  000022
  6374  007472' 001000  000312          27740           JZ      ERROR
  6375  007473' 000000  002102'
  6376  007474' 000000  007450'
  6377  007475' 001000  000315          27760           CALL    MOVMF           ;PUT CURRENT FAC INTO OUR ARG VARIABLE
  6378  007476' 000000  005264*
  6379  007477' 000000  007473'
  6380                                  27780                                   ;OUT OF FAC INTO [H,L] LOCATION
  6381  007500' 001000  000341          27800           POP     H               ;POP OFF FORMULA TXTPTR
  6382                                  27810   IFN     LENGTH-2,<
  6383                                  27820           CALL    FRMNUM>         ;EVALUATE IT AND MUST SURE ITS NUMERIC
  6384                                  27822   IFE     LENGTH-2,<
  6385  007501' 001000  000315          27824           CALL    FRMEVL
  6386  007502' 000000  005336'
  6387  007503' 000000  007476'
  6388  007504' 001000  000345          27826           PUSH    H
  6389  007505' 001000  000315          27828           CALL    FRCSNG
  6390  007506' 000000  006267*
  6391  007507' 000000  007502'
  6392  007510' 001000  000341          27830           POP     H>
  6393  007511' 001000  000053          27840           DCX     H
```

```
007512' 001000  000327          27860            CHRGET                      ;SEE IF TERMINATED
007513' 001000  000302          27880            JNZ     SNERR               ;IF NOT SYNTAX ERROR
007514' 000000  002072'
007515' 000000  007506'
                                27900                                        ;TO BE NICE SHOULD HAVE NEW CURLIN
                                27920                                        ;BUT VERY MESSY
007516' 001000  000341          27940            POP     H                   ;POP OFF POINTER AT ARG VARIABLE
007517' 001000  000321          27960            POP     D
007520' 001000  000301          27980            POP     B>                  ;POP OFF OLD VALUE
                                28000    IFN     MULDIM!STRING!FUNCTS,<
007521' 001000  000161          28020    DEFFIN: MOV     M,C
007522' 001000  000043          28040            INX     H                   ;STORE THE OLD VALUE
007523' 001000  000160          28060            MOV     M,B
007524' 001000  000043          28080    PUTDEI: INX     H
007525' 001000  000163          28100            MOV     M,E
007526' 001000  000043          28120            INX     H
007527' 001000  000162          28140            MOV     M,D
007530' 001000  000341          28160            POP     H                   ;POP OFF OLD TXTPTR
007531' 001000  000311          28180            RET>                        ;VALUE IS IN FAC -- ALL DONE
                                28200    IFN     FUNCTS,<
                                28220    ;
                                28240    ; SUBROUTINE TO SEE IF WE ARE IN DIRECT MODE AND
                                28260    ; COMPLAIN IF SO
                                28280    ;
007532' 001000  000345          28300    ERRDIR: PUSH    H                   ;SAVE THEIR [H,L]
007533' 001000  000052          28320            LHLD    CURLIN              ;SEE WHAT THE CURRENT LINE IS
007534' 000000  001607'
007535' 000000  007514'
007536' 001000  000043          28340            INX     H                   ;DIRECT IS 65,535 SO NOW 0
007537' 001000  000174          28360            MOV     A,H
007540' 001000  000265          28380            ORA     L                   ;IS IT ZERO NOW?
007541' 001000  000341          28400            POP     H
007542' 001000  000300          28420            RNZ                         ;RETURN IF NOT
007543' 001000  000036          28440            MVI     E,ERRID             ;"ILLEGAL DIRECT" ERROR
007544' 000000  000014
007545' 001000  000303          28460            JMP     ERROR
007546' 000000  002102'
007547' 000000  007534'
                                28480    ;
                                28500    ; SUBROUTINE TO GET A POINTER TO A FUNCTION NAME
                                28520    ;
007550' 001000  000317          28540    GETFNM: SYNCHK  FNTK                ;MUST START WITH "FN"
007551' 000000  000243
007552' 001000  000076          28560            MVI     A,128               ;DONT ALLOW AN ARRAY
007553' 000000  000200
007554' 001000  000062          28580            STA     SUBFLG              ;DON'T RECOGNIZE THE "(" AS
007555' 000000  001601'
007556' 000000  007546'
                                28600                                        ;THE START OF AN ARRAY REFEREENCE
007557' 001000  000266          28620            ORA     M                   ;PUT FUNCTION BIT ON
007560' 001000  000107          28640            MOV     B,A                 ;GET FIRST CHARACTER INTO [B]
                                28660    IFN     LENGTH-2,<
                                28680    IFN     STRING,<CALL    PTRGT2      ;REALLY GET THE POINTER
```

FORMULA EVALUATION

```
                                28700            JMP     CHKNUM>>            ;MAKE SURE ITS NOT A STRING NAME
007561' 001000  000303          28720    IFE     STRING&<LENGTH-2>,<JMP  PTRGT2>>
007562' 000000  006512'
007563' 000000  007555'
                                28740    PAGE
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