

```

MM      MM      EEEEEEEEE  CCCCCCCC  HH      HH      11
MM      MM      EEEEEEEEE  CCCCCCCC  HH      HH      11
MMMM    MMMM    EE          CC          HH      HH      1111
MMMM    MMMM    EE          CC          HH      HH      1111
MM      MM      EE          CC          HH      HH      11
MM      MM      EE          CC          HH      HH      11
MM      MM      EEEEEEEEE  CC          HHHHHHHHHH  11
MM      MM      EEEEEEEEE  CC          HHHHHHHHHH  11
MM      MM      EE          CC          HH      HH      11
MM      MM      EE          CC          HH      HH      11
MM      MM      EE          CC          HH      HH      11
MM      MM      EE          CC          HH      HH      11
MM      MM      EEEEEEEEE  CCCCCCCC  HH      HH      111111
MM      MM      EEEEEEEEE  CCCCCCCC  HH      HH      111111

```

```

44      44      000000      000000      44      44      000000      5555555555
44      44      000000      000000      44      44      000000      5555555555
44      44      00      00      00      00      44      44      00      00      55
44      44      00      00      00      00      44      44      00      00      55
44      44      00      0000      00      0000      44      44      00      0000      555555
44      44      00      0000      00      0000      44      44      00      0000      555555
444444444444  00 00 00 00 00 00 444444444444  00 00 00      55
444444444444  00 00 00 00 00 00 444444444444  00 00 00      55
44      44      0000      00      0000      00      44      0000      00      55
44      44      0000      00      0000      00      44      0000      00      55
44      44      00      00      00      00      44      00      00      55      55
44      44      00      00      00      00      44      00      00      55      55
44      44      000000      000000      44      44      000000      555555
44      44      000000      000000      44      44      000000      555555

```

```

BBBB  U  U  N  N  DDDD  Y  Y      AAA
B  B  U  U  N  N  D  D  Y  Y      A  A
B  B  U  U  NN  NN  D  D  Y  Y      A  A
BBBB  U  U  N  N  N  D  D  Y  Y      A  A
B  B  U  U  N  NN  D  D  Y  Y      AAAAA
B  B  U  U  N  N  D  D  Y  Y      A  A
BBBB  UUUUU  N  N  DDDD  Y  Y      A  A

```

LPTSPL VERSION 6(344) RUNNING ON LPT500
START USER BUNDY A [400,405] JOB MECH1 SEQ. 3381 DATE 19-NOV-75 17:14:58 MONITOR NETMON 5.07B V3 (AUG 12 T *START*
REQUEST CREATED: 19-NOV-75 17:16:10
FILE: DSKA1:MECH1[400,405] CREATED: 19-NOV-75 16:49:00 <155> PRINTED: 19-NOV-75 17:15:06
QUEUE SWITCHES: /PRINT:ARROW /FILE:ASCII /COPIES:1 /SPACING:1 /LIMIT:36 /FORMS:NORMAL
FILE WILL BE RENAMED TO <055> PROTECTION

```
*****.
* MECH1.
*PROLOG MECHANICS PROGRAM,
*ALAN BUNDY JULY 1975.
*****.
```

```
*OPERATIONS.
*****.
```

```
+-(GD,9). *UNARY MINUS.
+:(DG,8). *EXPONENTIATION.
+#(DG,1). *OR.
+&(DG,2). *AND.
+=(DG,3). *EQUALS.
++(GD,4). *PLUS.
+%(GD,5). *BINARY MINUS.
+.(DG,6). *MULTIPLICATION OR CONS.
+/(DG,7). *DIVISION.
```

```
*TRACE.
*****.
```

```
+TRACE(*X) -TFLAG -/ -SORTER(*X) -LIGNE.
+TRACE(*X).
+PROOF -PFLAG -/ -ETAT(*P) -SORTER(*P) -LIGNE.
+PROOF.
```

```
* MARPLES ALGORITHM.
*****.
```

```
*FIND(*XS,*ANS)
-GIVEN(*GS) -GETEQNS(*ES,*XS,*GS,NIL)
-TRACE(EQUATIONS-EXTRACTED-*ES)
-CONVERT(*ES,*ES1) -TRACE(CONVERTED-TO-*ES1)
-SIMPLIFY(*ES1,*ES2) -TRACE(SIMPLIFIED-TO-*ES2)
-SCONV(*XS,*XS1) -WORDSIN(*XS1,*XS2)
```

*(-SCONV (*XS, *XS1) - WORDSIN (*XS1, *XS2))*
↓
*-LMEASURE (*XS, *XS1)*

-TRACE(UNKNOWNNS-ARE-~~*XS~~);
-SIMSOLVE(*ES1,*XS1,*ANS) -TRACE(ANSWER-IS-*ANS).

+GETEQNS(TRUE,NIL,*GS,*US).

+GETEQNS(*E&*ES,*X.*XS,*GS,*US)
-MAKEEQN(*E,*U,*US) -WORDSIN(*E,*VS) -MEMBER(*X,*VS)
-UNION(*X.*XS,*GS,*YS) -SUBSET(*VS,*YS)
-GETEQNS(*ES,*XS,*X.*GS,*U.*US).

+GETEQNS(*E&*ES,*X.*XS,*GS,*US)
-MAKEEQN(*E,*U,*US) -WORDSIN(*E,*VS) -MEMBER(*X,*VS)
-UNION(*X.*XS,*GS,*YS) -SUBTRACT(*VS,*YS,*ZS)
-CONCAT(*XS,*ZS,*WS) -GETEQNS(*ES,*WS,*X.*GS,*U.*US).

+UNUSED(*NAME,*SIT,*US) -MEMBER(*NAME.*SIT,*US) -/ -FAIL.

+UNUSED(CONSTACCEL.*N1,*SIT,*US) -MEMBER((CONSTACCEL.*N2),*SIT,*US)
-MEMBER((CONSTACCEL.*N3).*SIT,*US) -DIFF(*N2,*N3) -/ -FAIL.

+UNUSED(*NAME,*SIT,*US).

*THE EQUATIONS.

+MAKEEQN(*T=*SUM,TIMESUM.*P,*US) -DURATION(*P,*T)
-UNUSED(TIMESUM,*P,*US) -SEGMENT(*P,*PS)
-SUMDURS(*PS,*SUM). **P.*OBJ*

+MAKEEQN(*D=*SUM,DISTSUM.*P,*US) -SEGMENT(*P,*PL)
-UNUSED(DISTSUM,*P,*US) -DISTANCE(*OBJ,*D,*P)
-SUMDIST(*OBJ,*PL,*SUM). **TIME.*OBJ*

+MAKEEQN(*V=*U+*A.*T,(CONSTACCEL.1).*TIME,*US) -PERIOD(*TIME)
-UNUSED(CONSTACCEL.1,*TIME,*US) -ACCEL(*OBJ,*A,*TIME)
-ISVINVAR(*A) -DIFF(*A,ZERO)
-DURATION(*TIME,*T) -INITVEL(*OBJ,*U,*TIME)
-FINVEL(*OBJ,*V,*TIME). **TIME.*OBJ*

+MAKEEQN(*D=*U.*T*(1,2).*A.*T:2,(CONSTACCEL.2).*TIME,*US)
-PERIOD(*TIME) -UNUSED(CONSTACCEL.2,*TIME,*US)
-ACCEL(*OBJ,*A,*TIME) -ISVINVAR(*A)
-DIFF(*A,ZERO) -DURATION(*TIME,*T)
-INITVEL(*OBJ,*U,*TIME) -DISTANCE(*OBJ,*D,*TIME).

+MAKEEQN(*V.*T=*S,CONSTVEL.*TIME,*US) -PERIOD(*TIME)
-UNUSED(CONSTVEL,*TIME,*US) -VEL(*OBJ,*V,*TIME)
-ISVINVAR(*V) -DURATION(*TIME,*T) -DISTANCE(*OBJ,*S,*TIME).

+SUMDURS(NIL,Ø).

+SUMDURS(*P.*PS,*T+*SUM) -DURATION(*P,*T) -/ -SUMDURS(*PS,*SUM).

remember to solve for
intermediate unknowns.
+ LMEASURE (NIL, NIL)
- MEASURE (*Q, *QL) - LMEASURE (*QL, *ML)

+ Makeeqn (*AV = *D / *T, AVREL.*P.*OBJ, *US)
- AVREL (*OBJ,*AV,*P) - Unused (AVREL,*P.*OBJ,*US)
- Distance (*OBJ,*D,*P) - Duration (*P,*T)

2: f-1/2

+SUMDIST(*OBJ,NIL,0).
+SUMDIST(*OBJ,*P.*PL,*D+*SUM) -DISTANCE(*OBJ,*D,*P)
-/-SUMDIST(*OBJ,*PL,*SUM).

+INITVEL(*OBJ,*U,*TIME) -INITIAL(*TIME,*BEGIN) -VEL(*OBJ,*U,*BEGIN).

+FINVEL(*OBJ,*V,*TIME) -FINAL(*TIME,*END) -VEL(*OBJ,*V,*END).

+ISVINVAR(ZERO) -/.
+ISVINVAR(*Q) -ISVECT(*Q) -MEASURE(*Q,*M) -ISINVAR(*M)
-DIRECTION(*Q,*A1,*A2) -ISINVAR(*A1) -ISINVAR(*A2) -/.
+ISSINVAR(ZERO) -/.
+ISSINVAR(*Q) -ISSCAL(*Q) -MEASURE(*Q,*M) -ISINVAR(*M) -/.
+ISINVAR(*V) -CONST(*V) -/.
+ISINVAR(*V) -ISNUM(*V) -/.
+ISINVAR(*V) -ISSYM(*V) -/-FAIL.
+ISINVAR(*V) -UNIV(*V,*S.*ARGS) -/-LISINVAR(*ARGS).
+LISINVAR(NIL) -/.
+LISINVAR(*V.*VL) -ISINVAR(*V) -LISINVAR(*VL) -/.

+ISVCONST(ZERO) -/.
+ISVCONST(*Q) -ISVECT(*Q) -MEASURE(*Q,*M) -ISCONST(*M)
-DIRECTION(*Q,*A1,*A2) -ISCONST(*A1) -ISCONST(*A2).
+ISSCONST(*Q) -ISSCAL(*Q) -MEASURE(*Q,*M) -ISCONST(*M).
+ISCONST(*V) -ISNUM(*V) -/.
+ISCONST(*V) -UNIV(*V,*S.NIL) -/-FAIL.
+ISCONST(*V) -UNIV(*V,*S.*ARGS) -/-LISCONST(*ARGS).
+LISCONST(NIL).
+LISCONST(*V.*VL) -ISCONST(*V) -/-LISCONST(*VL).

+ISVECT(*Q) -DIRECTION(*Q,*A1,*A2).
+ISSCAL(*Q) -DIRECTION(*Q,*A1,*A2) -/-FAIL.
+ISSCAL(*Q) -MEASURE(*Q,*M).

*UNIT CONVERSION.
*****.

+CONVERT(*ES,*ES1) -STANDSYS(*SYS) -ECONV(*ES,*ES1).

+SCONV(NIL,NIL).

+SCONV(*E,*ES,*E1,*ES1) -ECONV(*E,*E1) -SCONV(*ES,*ES1).

+ECONV(TRUE,TRUE) -/.

+ECONV(*E,*E) -ISNUM(*E) -/.

+ECONV(*E,*E1) -ISWORD(*E) -/ -VCONV(*E,*E1).

+ECONV(*E,*E1) -UNIV(*E,*S,*ARGS) -SCONV(*ARGS,*ARGS1)
-UNIV(*E1,*S,*ARGS1).

+VCONV(*V,*M) -UNIT(*V,*U) -STANDARD(*U,*U) -/ -MEASURE(*V,*M).

+VCONV(*V,*M1) -UNIT(*V,*U) -STANDARD(*U,*U1) -MEASURE(*V,*M)
-MCONV(*M,*U,*M1,*U1). ← SIMPLIFY (*M1,*M2)

+STANDARD(*U,*U1) -STANDSYS(*SYS) -DIMENSIONS(*U,*D)
-STANDUNIT(*D,*U1,*SYS).

+DIMENSIONS(HRS,T) -/.

+DIMENSIONS(MINS,T) -/.

+DIMENSIONS(SECS,T) -/.

+DIMENSIONS(MLS,L) -/.

+DIMENSIONS(YDS,L) -/.

+DIMENSIONS(FT,L) -/.

+DIMENSIONS(INS,L) -/.

+DIMENSIONS(*U,*U) -ISCONST(*U) -/.

+DIMENSIONS(*U,*D) -UNIV(*U,*S,*ARGS)
-LDIMENSIONS(*ARGS,*DARGS) -UNIV(*D,*S,*DARGS).

+LDIMENSIONS(NIL,NIL).

+LDIMENSIONS(*U,*UL,*D,*DL) -DIMENSIONS(*U,*D)
-LDIMENSIONS(*UL,*DL).

-VCONV (V, *M2) - unit (V, ft/sec)
- standard (ft/sec, ft/min) - measure (V, Z)
- MCONV (Z, ft/sec, *M1, ft/min)

-Factor (*c, Min, (P/sec)
V. 60

+MCONV(*M,*U,*C,*M,*U1) -FACTOR(*C,*U1,*U).
+INA(60,MINS,HRS).
+INA(60,SECS,MINS).
+INA(1760,YDS,MLS).
+INA(3,FT,YDS).
+INA(12,INS,FT).
+FACTOR(1,*U,*U) -ISUNIT(*U) -/.
+FACTOR(*U,*U,*U) -ISCONST(*U) -/. *FOR SQUARES ETC.
+FACTOR(*C,*U1,*U) -INA(*C,*U1,*U) -/.
+FACTOR(*C,*U1,*U) -COMP(*U1)
-UNIV(*U1,*S,*ARGS1) -UNIV(*U,*S,*ARGS)
-SFACTOR(*CS,*ARGS1,*ARGS) -UNIV(*C,*S,*CS) -/.
+FACTOR(^{*C:-1}1/*C,*U1,*U) -BEFORE(*U,*U1) -FACTOR(*C,*U,*U1) -/.
+FACTOR(*C1,*C2,*U2,*U) -INA(*C1,*U1,*U)
-FACTOR(*C2,*U2,*U1) -/.
+SFACTOR(NIL,NIL,NIL) -/.
+SFACTOR(*C,*CS,*U1,*US1,*U,*US) -FACTOR(*C,*U1,*U)
-SFACTOR(*CS,*US1,*US).
+BEFORE(*U,*U1) -DIMENSIONS(*U,*D) -POSN(*D,*U,*P)
-POSN(*D,*U1,*P1) -INF(*P,*P1) -/.
+POSN(T,SECS,1).
+POSN(T,MINS,2).
+POSN(T,HRS,3).
+POSN(L,INS,1).
+POSN(L,FT,2).
+POSN(L,YDS,3).
+POSN(L,MLS,4).
+ISUNIT(*U) -POSN(*D,*U,*N).

VCONV (

LINEAR



* VARIABLES IN.

X

+WORDSIN(*E,NIL) -ISCONST(*E) -/.
+WORDSIN(*E,NIL) -ISVCONST(*E) -/.
+WORDSIN(*E,NIL) -ISSCONST(*E) -/.
+WORDSIN(*E,*E.NIL) -ISWORD(*E) -/.
+WORDSIN(*E,*VS) -UNIV(*E,*S.*ARGS) -SWORDSIN(*ARGS,*VS).
+SWORDSIN(NIL,NIL).
+SWORDSIN(*ARG.*ARGS,*VS)
-WORDSIN(*ARG,*V1) -SWORDSIN(*ARGS,*V2) -UNION(*V1,*V2,*VS).
+ISSYM(*E) -UNIV(*E,*S.NIL).
+COMP(*E) -UNIV(*E,*S.NIL) -/ -FAIL.
+COMP(*E).
+ISNUM(*E) -ISINTEGER(*E).
+ISWORD(*E) -UNIV(*E,(*H.*T).NIL) -LETTRE(*H).
+ISINTEGER(*N) -ISNATNUM(*N).
+ISINTEGER(*N) -UNIV(*N,(-.NIL).*N1) -ISNATNUM(*N1).
+ISNATNUM(*N) -UNIV(*N,*DS.NIL) -SDIGITS(*DS).
+SDIGITS(NIL).
+SDIGITS(*D.*DS) -CHIFFRE(*D) -SDIGITS(*DS).
+DIFF(*X,*X) -/ -FAIL.
+DIFF(*X,*Y).

*LISTS.
*****.

+CONCAT(NIL,*BL,*BL).
+CONCAT(*A.*AL,*BL,*CL) -CONCAT(*AL,*A.*BL,*CL).

*SETS.
*****.

+SUBSET(NIL,*BS).
+SUBSET(*A.*AS,*BS) -MEMBER(*A,*BS) -/ -SUBSET(*AS,*BS).

+SUBTRACT(NIL,*BS,NIL).

+SUBTRACT(*A,*AS,*BS,*CS) -MEMBER(*A,*BS) -/ -SUBTRACT(*AS,*BS,*CS).

+SUBTRACT(*A,*AS,*BS,*A,*CS) -SUBTRACT(*AS,*BS,*CS).

+UNION(NIL,*YS,*YS).

+UNION(*X,*XS,*YS,*ZS) -MEMBER(*X,*YS) -/ -UNION(*XS,*YS,*ZS).

+UNION(*X,*XS,*YS,*ZS) -UNION(*XS,*X,*YS,*ZS).

+MEMBER(*X,*X,*YS).

+MEMBER(*X,*Y,*YS) -MEMBER(*X,*YS).

+FIN.