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GRAFTEK - GRAFFIT CURVE FITTING PROGRAM TEKTRONIX VERSION.(U)  
SEP 76 W D LUNGER

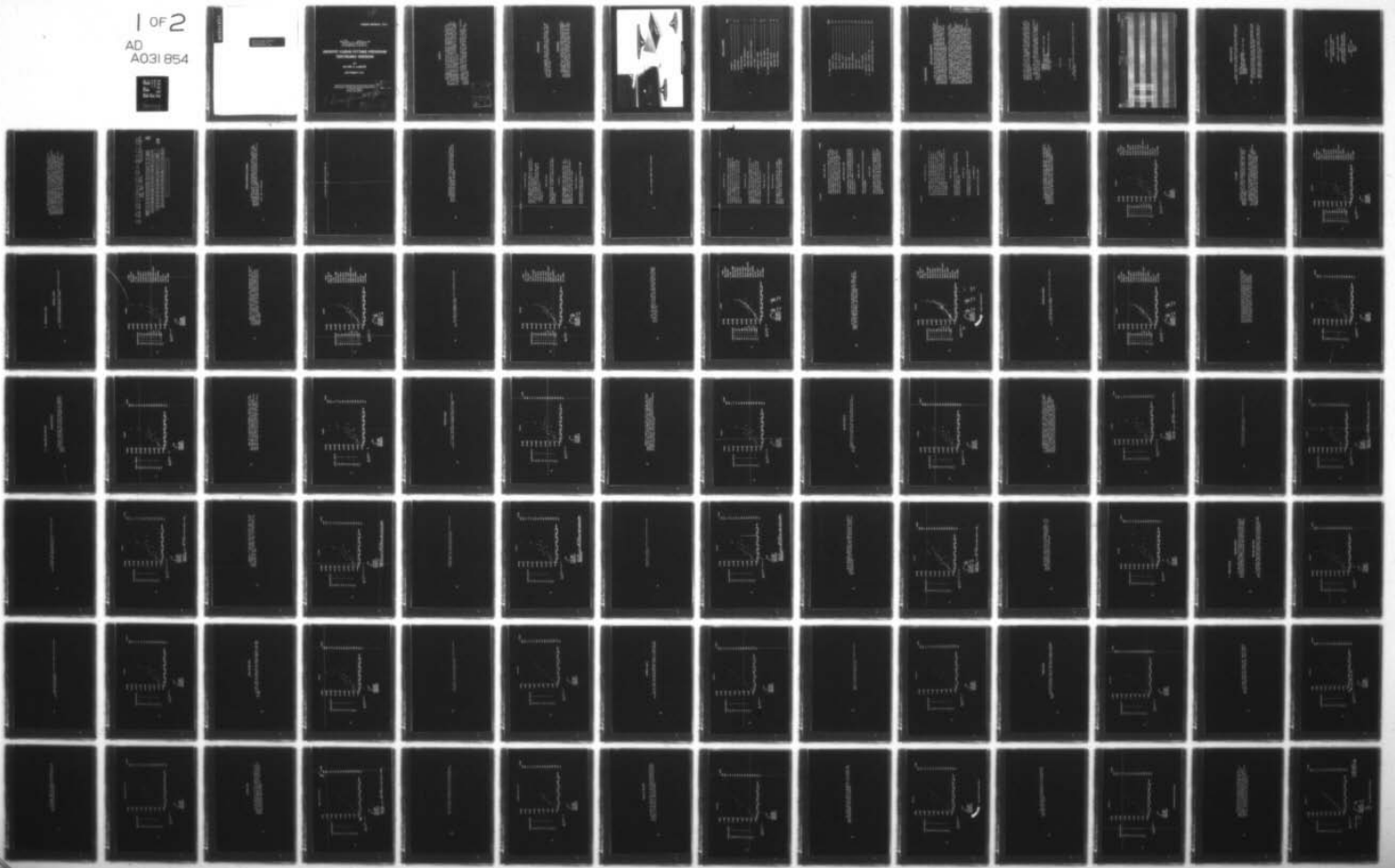
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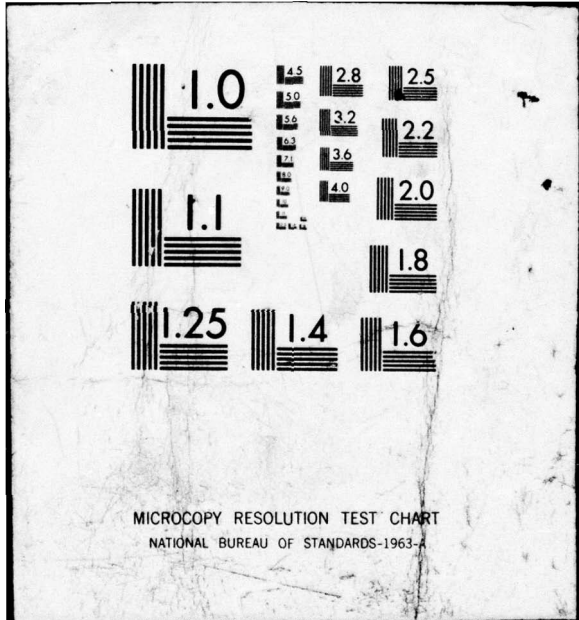
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3

**USERS MANUAL 76-3**

# **"GRAFTEK"**

## **GRAFFIT CURVE FITTING PROGRAM TEKTRONIX VERSION**

by  
**WAYNE D. LUNGER**

**SEPTEMBER 1976**

**SCIENTIFIC & ENGINEERING APPLICATIONS DIVISION  
MANAGEMENT INFORMATION SYSTEMS DIRECTORATE  
PICATINNY ARSENAL  
DOVER, NEW JERSEY**

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ABSTRACT

GRAF-TEK is an interactive graphics program that fits by least squares, a curve to N data points. This code combines two CDC 274 graphics curve fitting programs (GRAFFIT, LSQ) for use on the Tektronix 4014 storage tube using Tektronix software (TCS). The program fits the curve and determines the constants for any of nine empirical equations or a polynomial of up to 11th degree, and displays the fitted curve (up to three at one time) against a background of the data points.

Options include reading in new data, rescale of axes, deleting all displayed curves, deleting points, adding new points, restoring all original or selected deleted points, specifying constants, and calling for CALCOMP plotter or "quick look" hard copy of output.

I

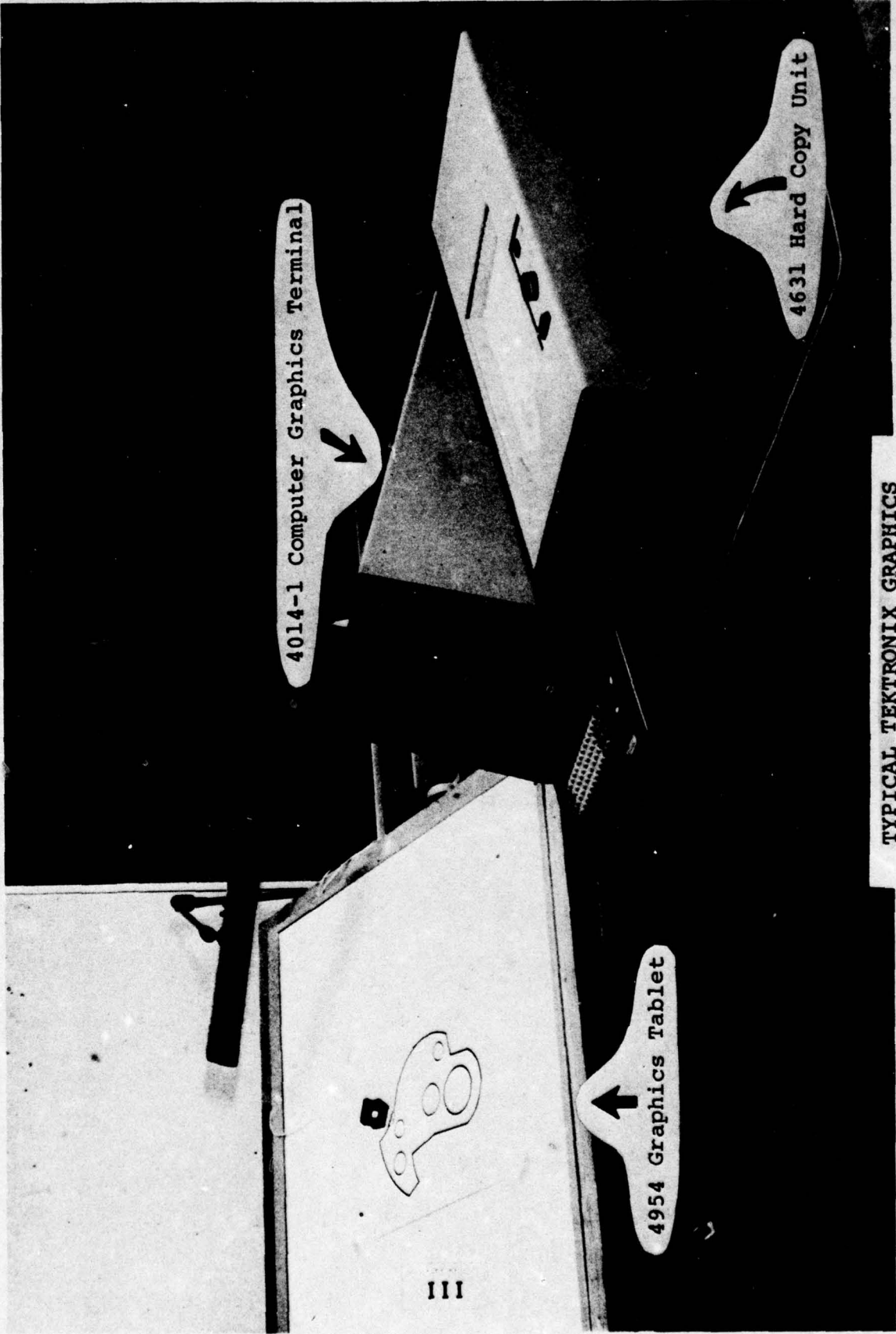
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ERIC	Back Section <input type="checkbox"/>
DISPATCHED	<input type="checkbox"/>
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ASSUMPTIONS

It is assumed that the reader is familiar with the SCOPE and INTERCOM systems at Picatinny Arsenal, Dover, N.J. and that he can successfully prepare a Tektronix Terminal for use.

DISCLAIMER

This report is issued for information and documentation purposes only. The authors, MISD, Picatinny Arsenal and Department of the Army are not responsible for the accuracy of the material contained herein; nor is the material presented to be construed as the official position of Picatinny Arsenal or the Department of the Army.



4014-1 Computer Graphics Terminal

4631 Hard Copy Unit

4954 Graphics Tablet

TYPICAL TEKTRONIX GRAPHICS  
CONFIGURATION

III

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## I. INITIALIZATION

### DATA SET PREPARATION

There are two ways that data sets may be read by GRAF-TEK. One way allows the user to type in the data via the Tektronix keyboard. To do this, simply initiate GRAF-TEK (follow instructions on RUNNING GRAF-TEK which follows this section) and when it recognizes that no data has been previously supplied it will set up the Tektronix terminal for data type in. Since this data preparation occurs during program execution, it will be described in detail later in the manual.

The other way has the user prepare data on punch cards prior to running GRAF-TEK. There are four types of data cards necessary for a complete data set. They are a title card, a number of points card, a real-type variable format card, and the (X,Y) data. The title card allows up to 70 consecutive alphanumeric characters (7A10) suitable to describe the data set. The number of points card indicates the number of (X,Y) pairs in the data set and is also identical to the number of cards necessary in card type four. This should be an integer, right justified (I3) ending in column 3, and at most 100. The variable format card contains a user determined format for the real-type data. A typical card might be (2F10.3). The last card type is the complete data set made up of two or more consecutive cards each prepared according to the variable

format card. These are the (X,Y) data points with each card having one (X,Y) pair. The number of cards needed then is the same as supplied on the number of points card. Any ordering of the data points is allowed. A typical data set is on the opposite page.

For GRAF-TEK to read these cards they must be pre-stored as a disk file on the CDC 6500/6600 computer. A separate job must be run prior to executing GRAF-TEK. The necessary control cards follow.....

GRAFTEK.  
COMMENT.(XXX-YYY,NNNNL), user name  
REQUEST,DATA,\*PF.  
COPYCF,INPUT,DATA.  
CATALOG,DATA,GRAFTEKDATA,ID= user name.  
7-8-9 card

.  
. .  
. . .

Data sets

.  
. .  
. . .

6-7-8-9 card

When this has been successfully achieved, you're ready to run GRAF-TEK.



RUNNING GRAF-TEK

After activating a Tektronix terminal and LOGIN has been successful, type the following control cards at the console...

```
ETL,100.  
FETCH,GRAFTEK,MISDSEAD.  
ATTACH,DATA,GRAFTEKDATA,ID= user name. *  
REQUEST,PLOT,*PF. **  
GRAFTEK.
```

NOTE: Supply this card only if data has been pre-stored on the CDC 6500/6600 computer system. The local file name DATA is required when attaching GRAF-TEK data.

\*\* Supply this card if data will be saved via HARD COPY for generating CALCOMP plots. Please review the discussion about this later in the manual.

# GRAF - TEK

CURVE FITTING ALGORITHM FOR A TEKTRONIX 4014  
GRAPHICS DISPLAY TERMINAL

DEVELOPED AT U.S. ARMY PICATINNY ARSENAL  
DOVER, NJ.

MANAGEMENT INFORMATION SYSTEMS DIRECTORATE  
SCIENTIFIC AND ENGINEERING APPLICATIONS DIVISION

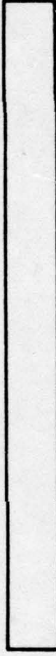
DEVELOPED BY  
R.E. BARNAS / U.D. LUNGER  
MARCH 1976  
VERSION 1

In order to logically flow through GRAF-TEK, commands must be made. To indicate this to the program the graphic cross-hairs are employed. Moving the cross-hairs is achieved by rotating the thumb wheels located on the right side of the console keyboard (see opposite page for a close-up view of the Tektronix keyboard). The intersection of the cross-hairs indicate the desired screen location. Place the cross-hairs over the intended option or curve mnemonic and then depress any keyboard key (except the return key). The performance of this task will be notated as "select the phrase" within the text of this manual.

POWER LOCAL/LINE  
 ASCII ALT  
 ON OFF KYBD ON OFF ON  
 CODE LOCKED CLEAR WRITE  
 EXPANDER LINE  
 3  
 1 OFF 2 FULL RELEASE AUTO PRINT COPY OFF  
 MARGIN CONTROL  
 OFF



RESET PAGE  
 ESC  
 TAB CTRL  
 TTY LOCK  
 { |  
 ~ ^  
 ! 1  
 " 2  
 # 3  
 \$ 4  
 % 5  
 & 6  
 ' 7  
 ( 8  
 ) 9  
 φ  
 \* :  
 = -  
 } }  
 BACK SPACE  
 Q W E R T Y U I O P  
 LF RETURN  
 A S D F G H J K L ; :  
 RUB OUT  
 Z X C V B N M < > .  
 ? /  
 SHIFT  
 SHIFT  
 BREAK



OPTIONS DESCRIPTION REQUEST

In order to see a description of each option, select the phrase YES. However, if the description is not required, select the phrase NO. It is suggested that initially a "quick look" hard copy be made of each page of description and used as an aid during program execution.

Here, YES is selected.

DO YOU WISH TO SEE A DESCRIPTION OF THE OPTIONS. PICK

YES

NO

Immediately the screen erases and the first page of option description appears. To read the next page, select the phrase NEXT PAGE or at any time end the description set by selecting the phrase FINISHED.

## READ IN NEW DATA (READ)

CAUSES THE CURRENT SCREEN CONTENTS TO ERASE AND THE NEXT DATA SET TO BE READ. SUBSEQUENTLY, THE NEW DATA POINTS WILL APPEAR SCALED TO FIT NICELY WITHIN THE PROGRAM SUPPLIED AXES.

IF THE DATA SETS HAVE BEEN EXHAUSTED, THERE ARE THREE CHOICES.

- 1- TYPE IN A NEW DATA SET VIA THE ALPHANUMERIC KEYBOARD, OR
- 2- REREAD THE OLD DATA SET, OR
- 3- END GRAF-TEK.

## RESCALE AXES (RESC)

SELECTS A SCALE SUCH THAT ALL THE DATA POINTS WILL FIT NICELY WITHIN THE PROGRAM SUPPLIED AXES. THE SCREEN WILL CLEAR AND THE NEW RESCALED AXES WILL APPEAR.

## S-L FORM (S-L)

CHANGES THE SCREEN PHRASES TO A SHORT, MORE CRYPTIC DISPLAY. THIS SHORTENS DISPLAY REGENERATION TIME AND TAKES EFFECT THE NEXT TIME THE SCREEN IS ERASED. SELECT AGAIN TO RETURN TO THE LONG FORM. IT IS SUGGESTED THAT A COPY BE MADE OF THE LONG FORM DISPLAY AND USED AS A REFERENCE WHEN THE SHORT FORM OPTION IS IN EFFECT.

## DELETE ALL CURVES (D CU)

CLEARNS THE SCREEN AND RETURNS A DISPLAY THAT REFLECTS THE CURRENT DATA SET STATUS WITH ALL CURVES ELIMINATED.

Again, the phrase NEXT PAGE is selected.

## DELETE POINT(S) (D PT)

ENABLES THE DELETION OF A POINT OR COMBINATION OF POINTS FROM THE DATA SET SO THAT MODIFIED CURVE FITTINGS MAY BE OBTAINED - PERHAPS GIVING A BETTER FIT. IN ORDER TO DELETE A POINT, LOCATE THE CROSS-HAIRS OVER THE DESIRED POINT REPRESENTED BY AN X OR Z AND TYPE ANY ARBITRARY CHARACTER. AN O WILL APPEAR OVER THE X OR Z INDICATING THAT FUTURE CALCULATIONS ON THE CURRENT DATA SET WILL NOT INCLUDE THE DELETED POINT(S).

## ADD NEW POINT(S) (ADD)

ALLOWS THE ADDITION OF NEW DATA POINTS TO THE CURRENT DATA SET VIA THE ALPHANUMERIC KEYBOARD. THE DATA IS ENTERED IN PAIRS OF X AND Y COORDINATES WITH EACH ELEMENT FOLLOWED BY A COMMA. THE DATA IS ENTERED IN FREE FORMAT, WITH OR WITHOUT A DECIMAL POINT, OR CAN BE ENTERED IN E FORMAT NOTATION. MORE THAN ONE LINE OF DATA CAN BE ENTERED. THE ADDED DATA POINTS WILL APPEAR AS AN X.

## ORIGINAL POINTS (ORIG)

CLEAR THE SCREEN AND REDISPLAYS THE ORIGINAL SET OF DATA POINTS.

## NEW PTS. NOW ORG (NEU)

CLEAR THE SCREEN AND CLEANS UP THE CURRENT DATA SET. ALL DELETED POINTS ARE PERMANENTLY ELIMINATED AND ALL ADDED POINTS ARE PERMANENTLY RETAINED. NOW SELECTING "ORIGINAL POINTS" WILL RETURN THIS CLEANED UP DATA SET.

NEXT PAGE

FINISHED

DISPLAY A CURVE (DISP)

ALLOWS FOR THE SELECTION OF ANY OF THE NINE EMPIRICAL OR ELEVEN NTH DEGREE POLYNOMIAL EQUATIONS AT THE LEFT OF THE GRAPH AREA. A MAXIMUM OF THREE CURVES MAY BE DISPLAYED AT ONE TIME. TO DISPLAY ADDITIONAL CURVES THE PHRASE 'DELETE ALL CURVES' MUST FIRST BE CHOSEN. ONCE 'DISPLAY A CURVE' HAS BEEN SELECTED, EACH OF THE THREE CURVES MAY BE PICKED CONSECUTIVELY WITHOUT RE-SELECTING 'DISPLAY A CURVE'.

RESTORE DELETED POINTS (REST)

ALLOWS ANY PREVIOUSLY DELETED POINT TO BE RESTORED AND INCLUDED AGAIN IN THE CURRENT DATA SET. PLACE THE CROSS-HAIRS OVER THE DESIRED POINT AND TYPE ANY ARBITRARY CHARACTER. THE O OF THE DELETED POINT WILL BE WRITTEN OVER WITH A S.

REVERSE X AND Y (REVE)

CLEARNS THE SCREEN AND REDISPLAYS THE DATA SET WITH THE X VALUES AND Y VALUES INTERCHANGED.

HARD COPY (HARD)

STORES ALL NECESSARY INFORMATION ABOUT THE LAST DISPLAYED CURVE ON TO A DISK STORAGE FILE WITH LOCAL FILE NAME PLOT. CATALOGING PLOT AT THE CONCLUSION OF GRAF-TEK WILL SAVE THE FILE SO THAT A CAL-COMP DRUM PLOT CAN BE PREPARED AT A LATER TIME BY RUNNING THE GRAF-TEK PLOT PROGRAM.

NEXT PAGE

FINISHED

SPECIFY CONSTANTS (SPEC)

ALLOWS EXPERIMENTATION ON ANY EMPIRICAL EQUATION SELECTED TO FIT THE DATA. A CURVE IS SELECTED IN THE NORMAL FASHION AND ITS RESULTS DISPLAYED. THEN ANY OF THE CALCULATED CONSTANTS CAN BE MODIFIED TO SEE THEIR EFFECT. SELECTING THE PHRASE 'DISPLAY' WILL CAUSE THE MODIFIED EQUATION TO BE PLOTTED AND ITS RESULTS TO APPEAR. TO CHANGE MORE THAN ONE CONSTANT, SELECT THE PHRASE 'ENTER'. ONLY ONE EMPIRICAL EQUATION CAN BE WORKED ON AT A TIME. THERE ARE ONLY TWO PHRASES THAT CAN BE SELECTED TO GET OUT OF THIS OPTION, AND THEY ARE 'DONE' AND 'END OF PROGRAM' (END).

CHANGE TITLE (CHAN)

ALLOWS THE CURRENT TITLE TO BE CHANGED TO A NEW TITLE. UP TO 70 CHARACTERS ARE ALLOWED AND IT WILL REAPPEAR IN ITS NORMAL POSITION THE NEXT TIME THE SCREEN CLEARS.

PUNCH DECK (PUNC)

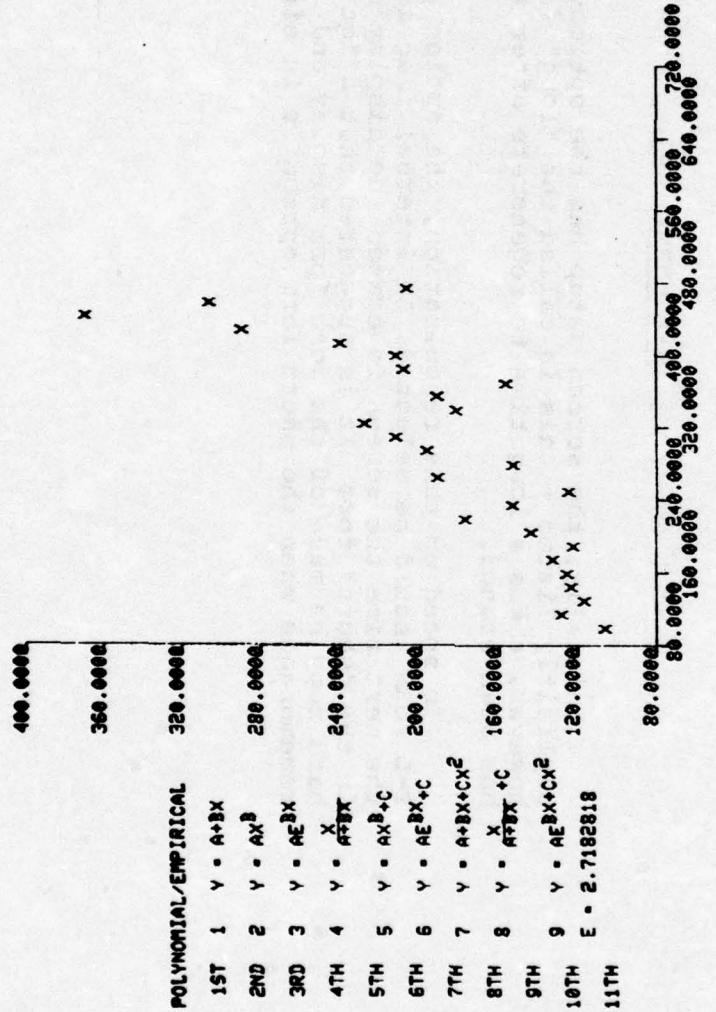
GIVES PUNCH DECK OUTPUT WHICH CONTAINS ANY ADDED AND ALL NON-DELETED POINTS REPRESENTING THE CURRENT DATA SET.

END OF PROGRAM (END)

TERMINATES GRAF-TEK AND CLEARS THE SCREEN.

If the phrase FINISHED had been selected or description set exhausted, the following display appears. On the left of the display is the set of 11 polynomials and 9 empirical equations; in the center is the point and curve viewing axis; on the right is the option list; and, on the bottom is an area for results and additional procedure requests.

PICATINNY



S-L FORM

Initially, the screen setup has the options and curves explicitly listed - this is called the "long" form. This, however, takes a long time to regenerate after the screen has been erased.

To speed up this regeneration, the option phrase S-L FORM should be selected. An internal flag is set, and the next time the screen is erased the display will regenerate in the "short" form. It is suggested that a "quick look" hard copy be made of the long form display and used as a remembrance when the short form option is in effect.

PICATINNY

POLYNOMIAL/EMPIRICAL	400.0000	360.0000	320.0000	280.0000	240.0000	200.0000	160.0000	120.0000	80.0000	OPTIONS
1ST 1 Y = A+BX										READ IN NEW DATA
2ND 2 Y = AX <sup>2</sup>										RESCALE AXES
3RD 3 Y = AE <sup>2</sup> BX										5-L FORM
4TH 4 Y = X A <sup>2</sup> BX										DELETE ALL CURVES
5TH 5 Y = AX <sup>2</sup> +C										DELETE POINT(S)
6TH 6 Y = AE <sup>2</sup> BX+C										ADD NEW POINT(S)
7TH 7 Y = A+BX+CX <sup>2</sup>										ORIGINAL POINTS
8TH 8 Y = X A <sup>2</sup> BX +C										NEW PTS. NOW ORG.
9TH 9 Y = AE <sup>2</sup> BX+CX <sup>2</sup>										DISPLAY A CURVE
10TH E = 2.7182818										RESTORE DELETED POINT(S)
11TH										REVERSE X AND Y
										SPECIFY CONSTANTS
										HARD COPY
										CHANGE TITLE
										PUNCH DECK
										END OF PROGRAM

NO. OF POINTS = 26  
BEST FIT =

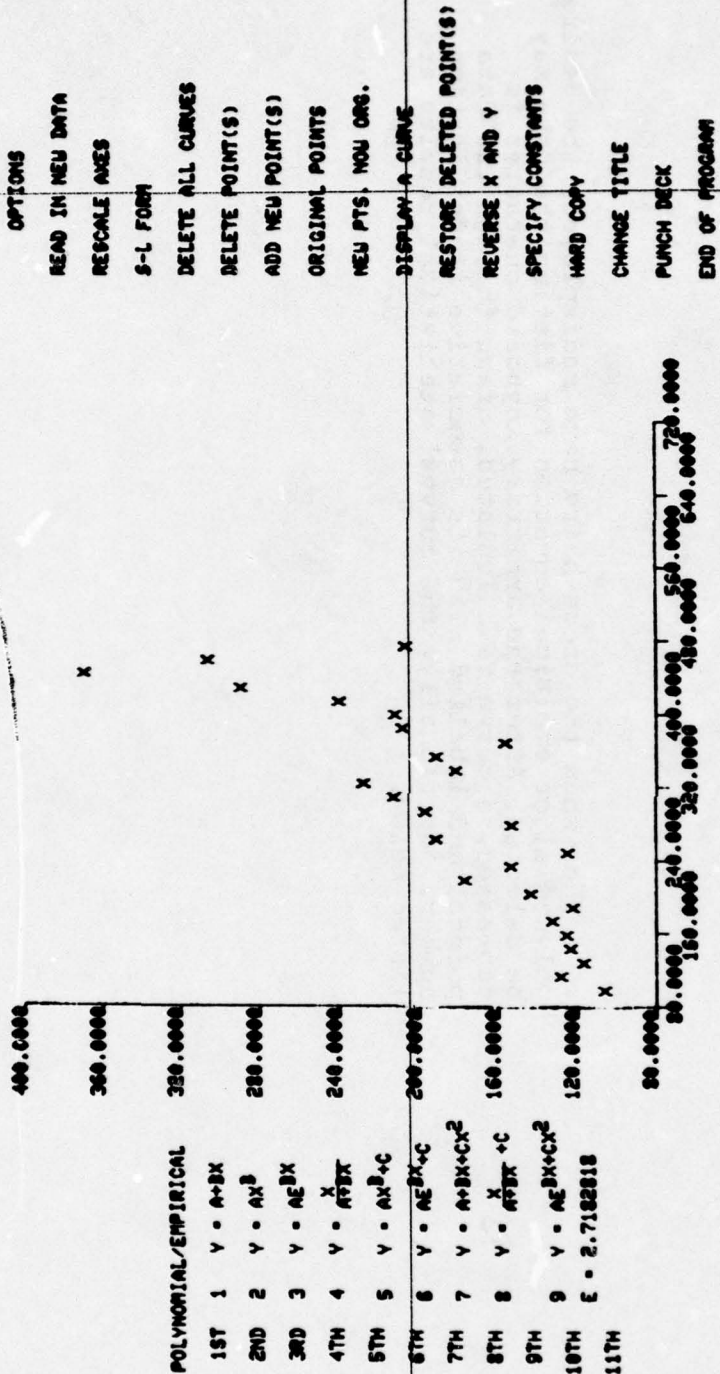
CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

II. DISPLAYING A CURVE

DISPLAY A CURVE

To begin searching for the best curve fitting the data set, select the phrase DISPLAY A CURVE.

PICATIMMY

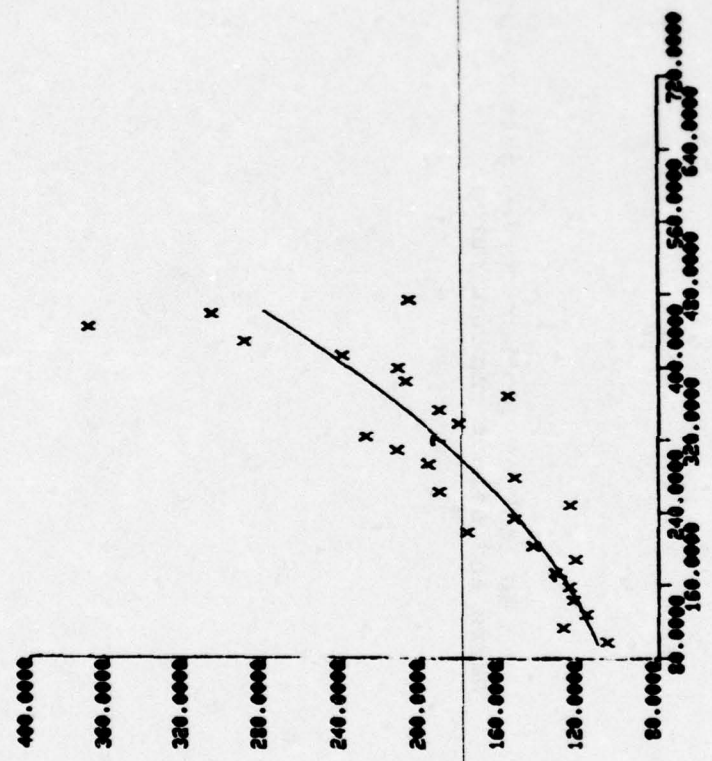


NO. OF POINTS = 26  
BEST FIT =

CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

Then when the cross-hairs have redisplayed, the desired polynomial or empirical equation for fitting the data may be selected. After the arbitrary keyboard character is depressed, a curve is calculated, drawn through the data points, and labelled with its associative identification number. Additionally, the curves' statistical results are listed below.

PICATINNY



- POLYNOMIAL/EMPIRICAL
- 1ST 1  $Y = A+Bx$
  - 2ND 2  $Y = Ax^2$
  - 3RD 3  $Y = Ae^{Bx}$
  - 4TH 4  $Y = \frac{X}{A+Bx}$
  - 5TH 5  $Y = Ax^2 + C$
  - 6TH 6  $Y = Ae^{Bx} + C$
  - 7TH 7  $Y = A+Bx+Cx^2$
  - 8TH 8  $Y = \frac{X}{A+Bx} + C$
  - 9TH 9  $Y = Ae^{Bx} + Cx^2$
  - 10TH 10  $E = 2.7182818$
  - 11TH

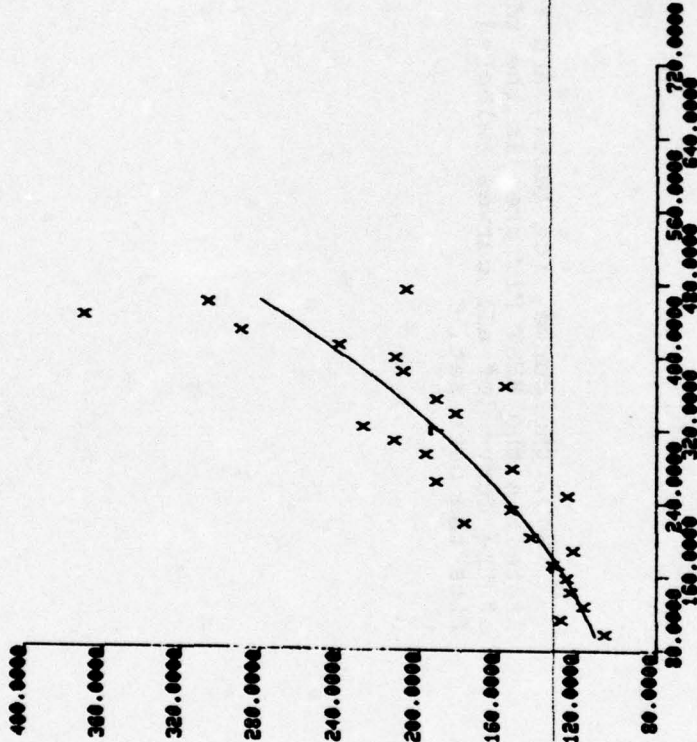
NO. OF POINTS = 26  
BEST FIT = 7

CURVE 7  
A = 101.4954  
B = .0440  
C = .0007  
STAND. ERROR OF ESTIMATE = 34.1810  
COEFFICIENT OF DETERMINATION = .7062

- OPTIONS
- READ IN NEW DATA
  - RESCALE AXES
  - S-L FORM
  - DELETE ALL CURVES
  - DELETE POINT(S)
  - ADD NEW POINT(S)
  - ORIGINAL POINTS
  - NEW PTS. NOW ORG.
  - DISPLAY A CURVE
  - RESTORE DELETED POINT(S)
  - REVERSE X AND Y
  - SPECIFY CONSTANT(S)
  - HARD COPY
  - CHANGE TITLE
  - PUNCH DECK
  - END OF PROGRAM

To look at another curve, just re-position the cross-hairs and select another curve.

PICATINNY



POLYNOMIAL/EMPIRICAL  
 1ST 1  $Y = A+BX$   
 2ND 2  $Y = AX^2$   
 3RD 3  $Y = A+BX$   
 4TH 4  $Y = A+BX$   
 5TH 5  $Y = AX^2+C$   
 6TH 6  $Y = A+BX+C$   
 7TH 7  $Y = A+BX+CX^2$   
 8TH 8  $Y = A+BX^2+C$   
 9TH 9  $Y = A+BX+CX^2$   
 10TH E = 2.7182818  
 11TH

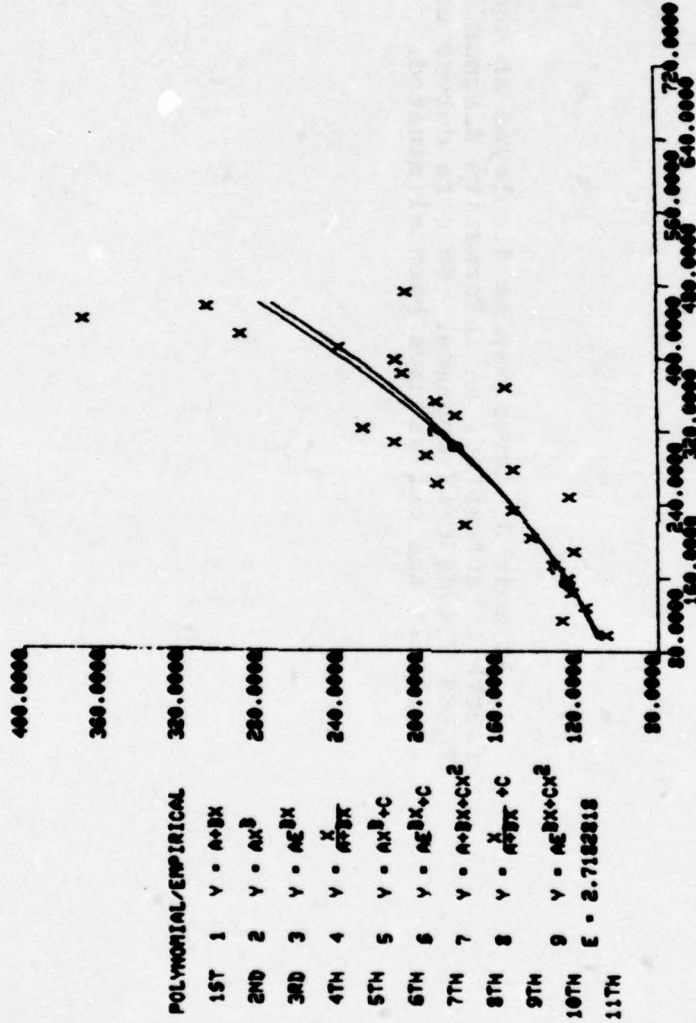
NO. OF POINTS = 26  
 BEST FIT = 7

CURVE 7  
 A = 101.4954  
 B = .0440  
 C = .0007  
 STAND. ERROR  
 OF ESTIMATE = 34.1910  
 COEFFICIENT OF  
 DETERMINATION = .7062

- OPTIONS  
 READ IN NEW DATA  
 RESCALE AXES  
 S-L FORM  
 DELETE ALL CURVES  
 DELETE POINT(S)  
 ADD NEW POINT(S)  
 ORIGINAL POINTS  
 NEW PTS. NOW ORG.  
 DISPLAY A CURVE  
 RESTORE DELETED POINT(S)  
 REVERSE X AND Y  
 SPECIFY CONSTANTS  
 HARD COPY  
 CHANGE TITLE  
 PUNCH DECK  
 END OF PROGRAM

Now, the curve, its label, and its results display.  
Listed in the BEST FIT area is the identification number  
of the curve (of all curves selected thus far) that best  
fits the data set.

PICATINNY



POLYNOMIAL/EMPIRICAL

- 1ST 1  $Y = A+BX$
- 2ND 2  $Y = AX^2$
- 3RD 3  $Y = AE^BX$
- 4TH 4  $Y = \frac{X}{A+BX}$
- 5TH 5  $Y = AX^B+C$
- 6TH 6  $Y = AE^BX+C$
- 7TH 7  $Y = A+BX+CX^2$
- 8TH 8  $Y = \frac{X}{A+BX}+C$
- 9TH 9  $Y = AE^BX+CX^2$
- 10TH E = 2.7182818
- 11TH

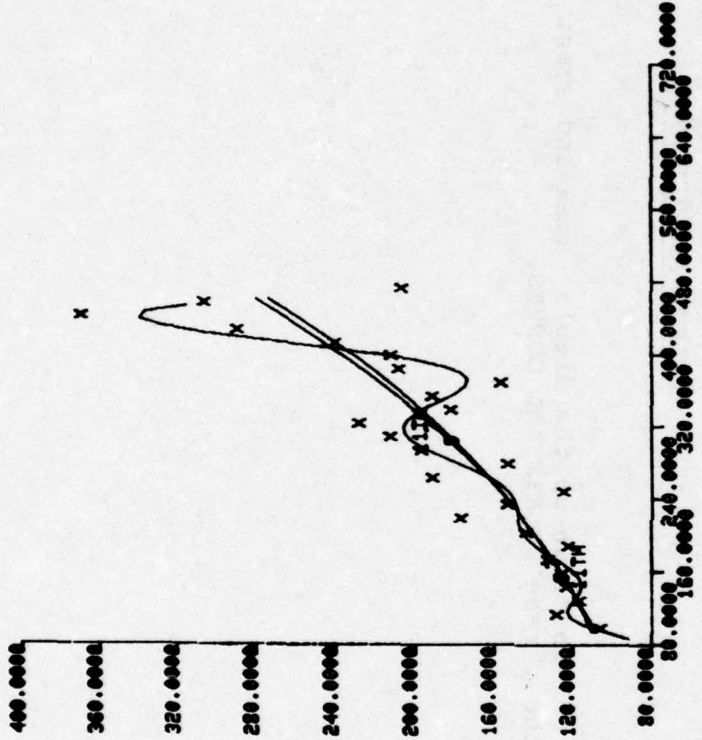
NO. OF POINTS = 26  
BEST FIT = 7

CURVE 7 9  
 A = 101.4954 80.2381  
 B = .0440 .0021  
 C = .0007 .0000  
 STAND. ERROR 34.3750  
 OF ESTIMATE = 34.1910  
 COEFFICIENT OF DETERMINATION = .7082 .6482

- OPTIONS
- READ IN NEW DATA
- RESAMPLE AXES
- S-L FORM
- DELETE ALL CURVES
- DELETE POINT(S)
- ADD NEW POINT(S)
- ORIGINAL POINTS
- NEW PTS. NOW ORG.
- DISPLAY A CURVE
- RESTORE DELETED POINT(S)
- REVERSE X AND Y
- SPECIFY CONSTANTS
- HARD COPY
- CHANGE TITLE
- PUNCH DECK
- END OF PROGRAM

At most 3 curves may be displayed at one time. If a fourth is attempted, an informative diagnostic MAXIMUM OF THREE CURVES ONLY appears. No more curves can be displayed until all the curves have been eliminated.

PICATINNY



- POLYNOMIAL/EMPIRICAL
- 1ST 1  $Y = A+BX$
  - 2ND 2  $Y = AX^2$
  - 3RD 3  $Y = AE^BX$
  - 4TH 4  $Y = \frac{X}{A+BX}$
  - 5TH 5  $Y = AX^2+C$
  - 6TH 6  $Y = AE^BX+C$
  - 7TH 7  $Y = A+BX+CX^2$
  - 8TH 8  $Y = \frac{X}{A+BX} + C$
  - 9TH 9  $Y = AE^BX+CX^2$
  - 10TH E = 2.7182818
  - 11TH

NO. OF POINTS = 26  
 BEST FIT = 7  
 11TH

CURVE	7	9	11TH
A =	101.4954	80.2381	
B =	.0440	.0021	
C =	.0007	.0000	
STAND. ERROR OF ESTIMATE =	34.1810	16.3589	
COEFFICIENT OF DETERMINATION =	.7062	.6482	.9327



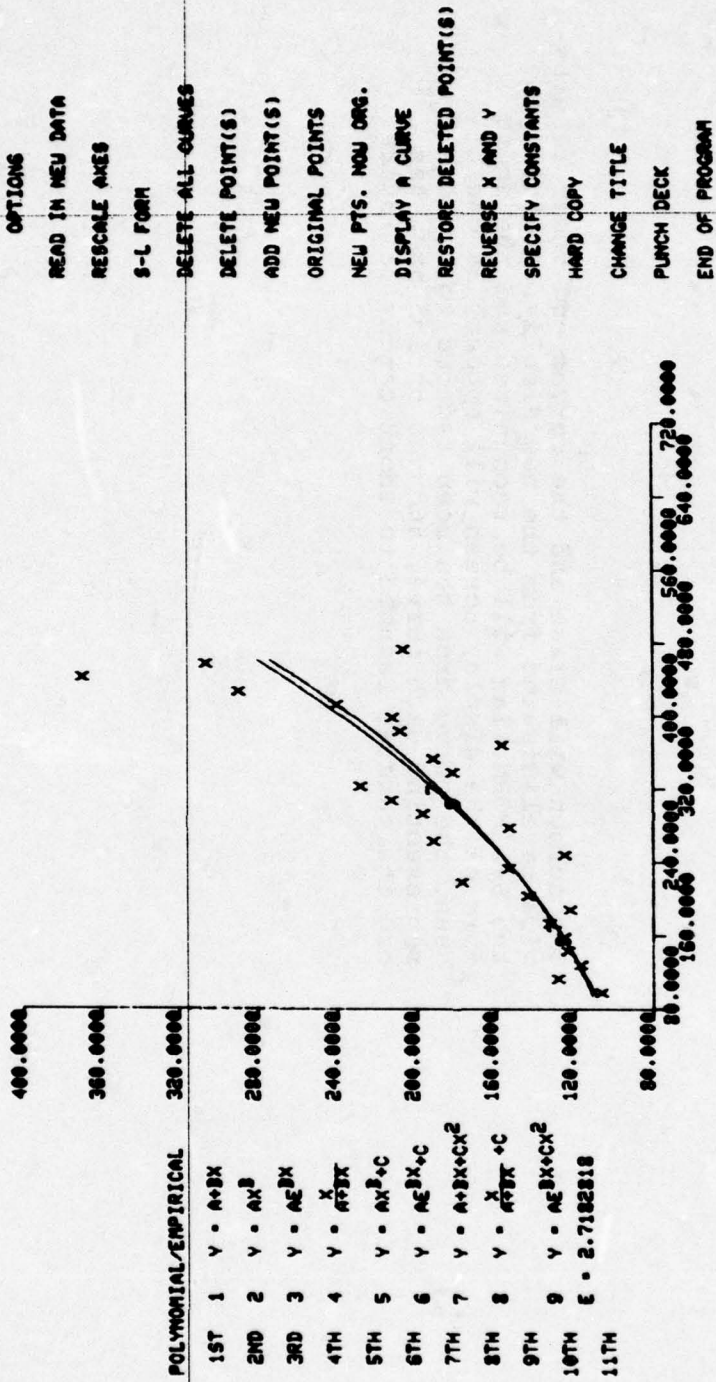
MAXIMUM OF THREE CURVES ONLY

- OPTIONS
- READ IN NEW DATA
  - RESCALE AXES
  - S-L FORM
  - DELETE ALL CURVES
  - DELETE POINT(S)
  - ADD NEW POINT(S)
  - ORIGINAL POINTS
  - NEW PTS. NOW ORG.
  - DISPLAY A CURVE
  - RESTORE DELETED POINT(S)
  - REVERSE X AND Y
  - SPECIFY CONSTANTS
  - HARD COPY
  - CHANGE TITLE
  - PUNCH DECK
  - END OF PROGRAM

DELETE ALL CURVES

To clean up the display area and start anew, select the phrase **DELETE ALL CURVES**.

PIGATINNY

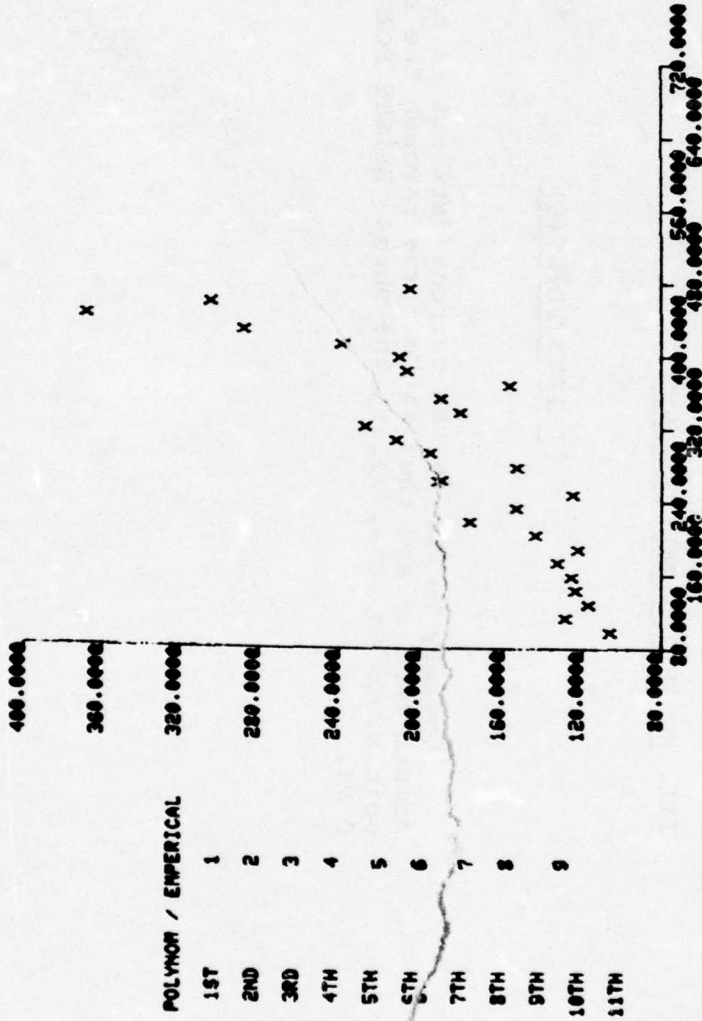


The screen will erase and the curves and their results will be eliminated from the new display. At this time the S-L FORM flag will be recognized and the short form of the display screen will appear. As can be seen, the curve area has been reduced to numbers representing each curve, and the option area has had its phrases reduced to short catchy reminders.

OPTIONS

READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEU  
 DISP  
 REST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END

PICATINNY



NO. OF POINTS - 26  
 BEST FIT -

CURVE

A .  
 B .  
 C .

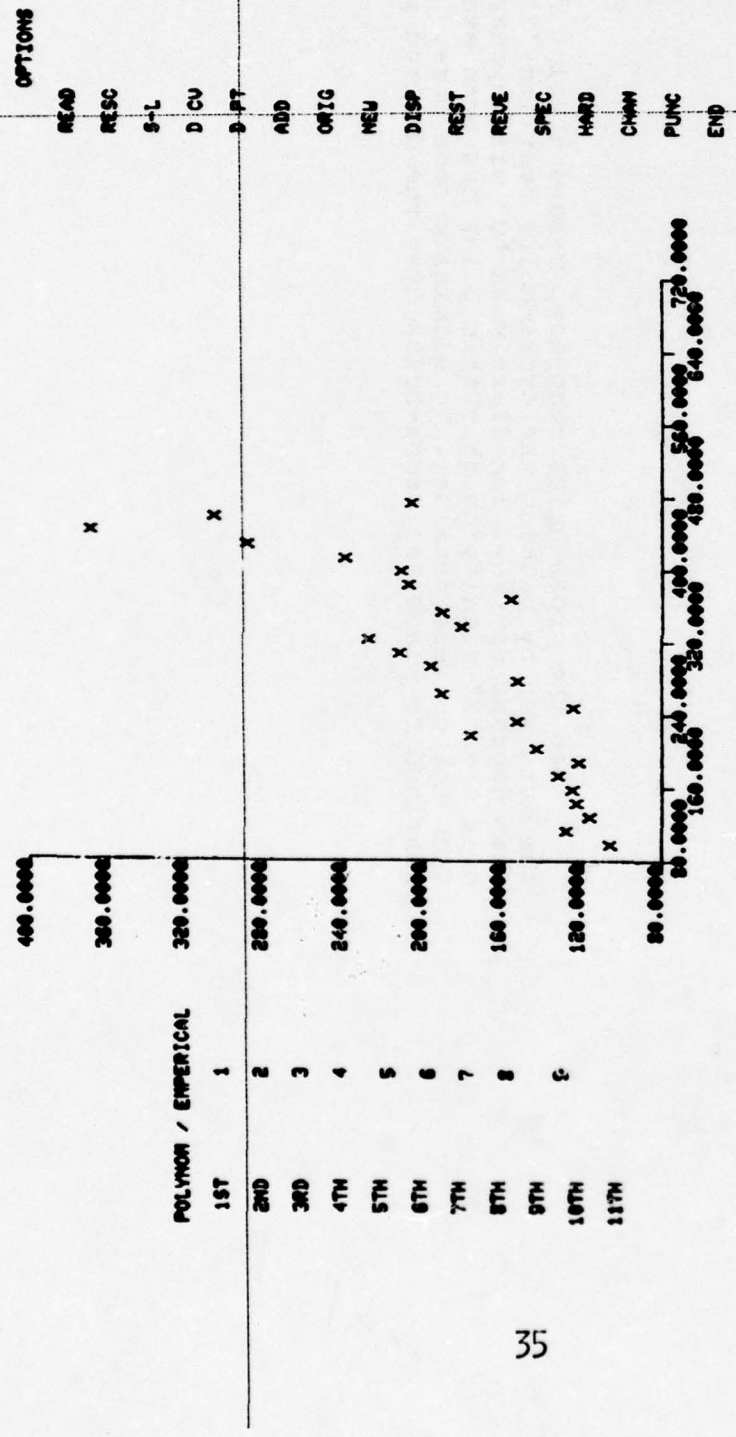
STAND. ERROR  
 OF ESTIMATE  
 COEFFICIENT OF  
 DETERMINATION

III. MODIFYING THE DATA SET

DELETE POINT(S)

One way to modify the current data set is to delete points from it and then fit a curve through the remaining points. To do this, select the phrase DELETE POINT(S) or D PT.

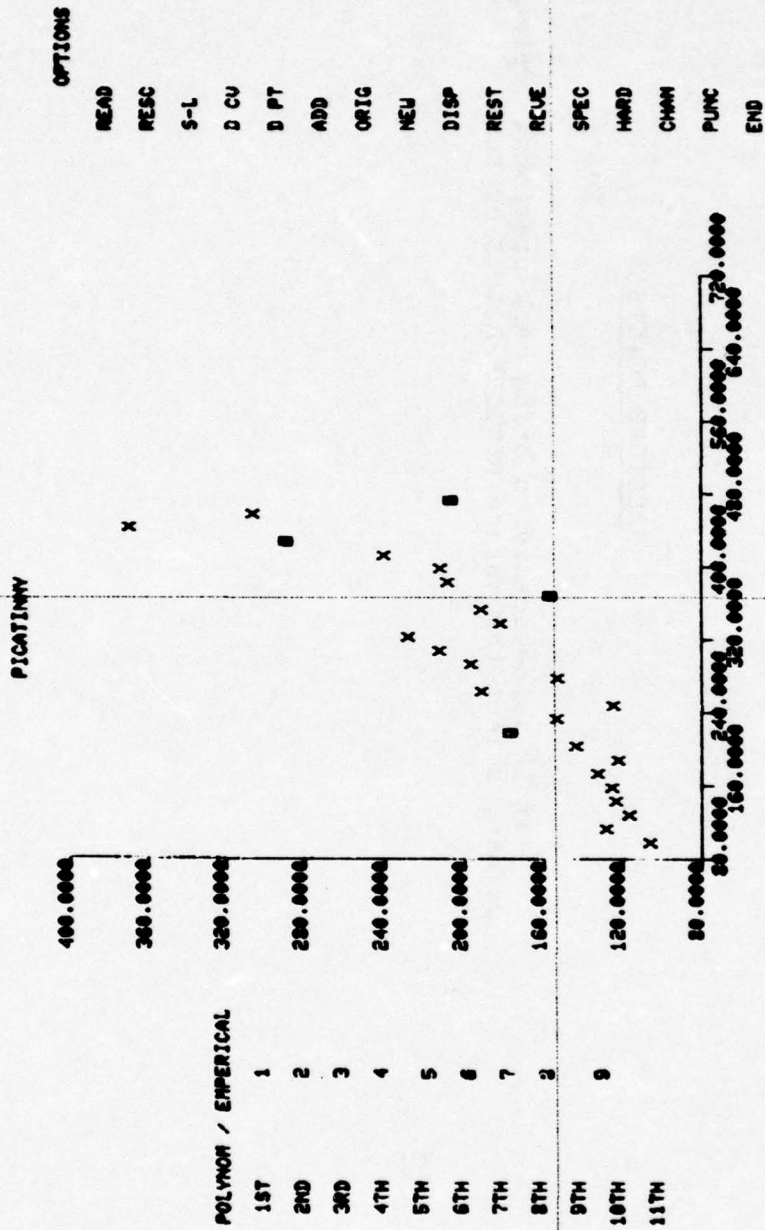
PICATINNY



NO. OF POINTS = 26  
BEST FIT =

CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

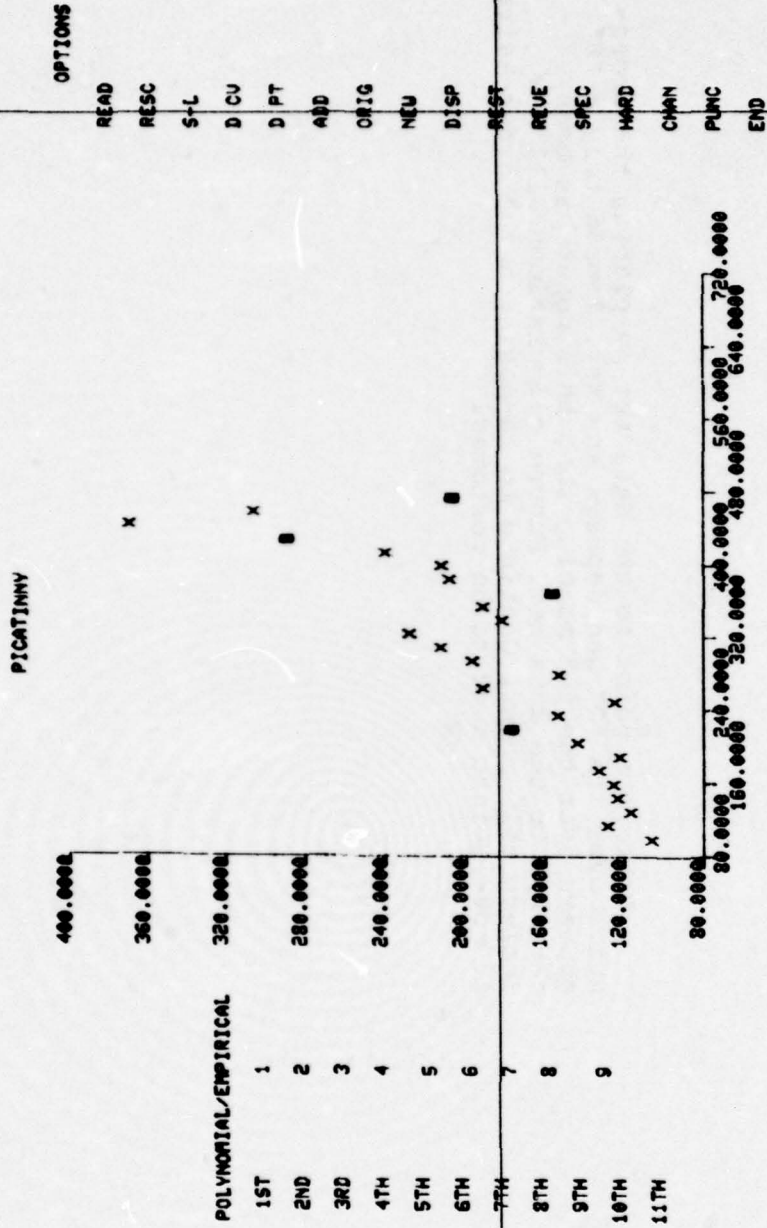
When the cross-hairs reappear, remove a point from the data set by placing the cross-hairs over its "X" and then depress any key. Immediately an "O" will appear over the "X" signifying that this point has been excluded from the current data set. To eliminate some more, continue to place the cross-hairs over the desired points.



NO. OF POINTS = 26  
 BEST FIT =

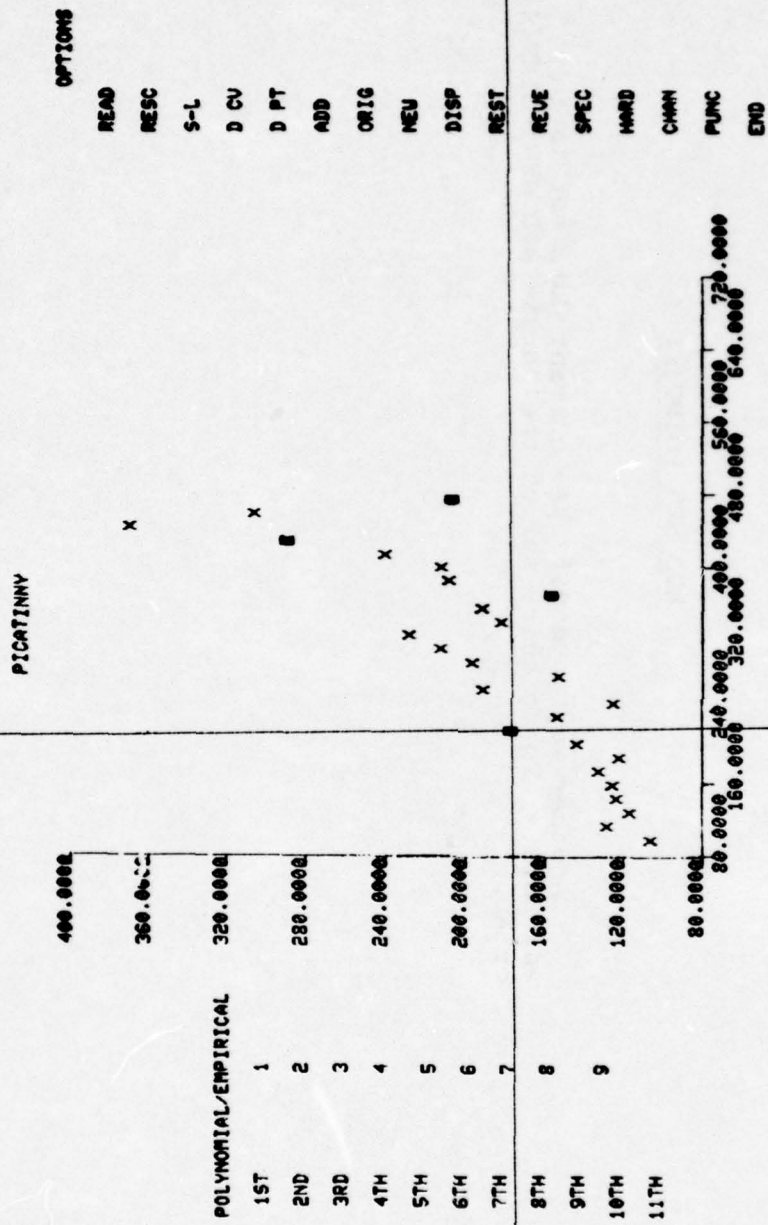
RESTORE POINTS

If it is necessary to bring back previously deleted points, select the phrase RESTORE POINTS or REST.



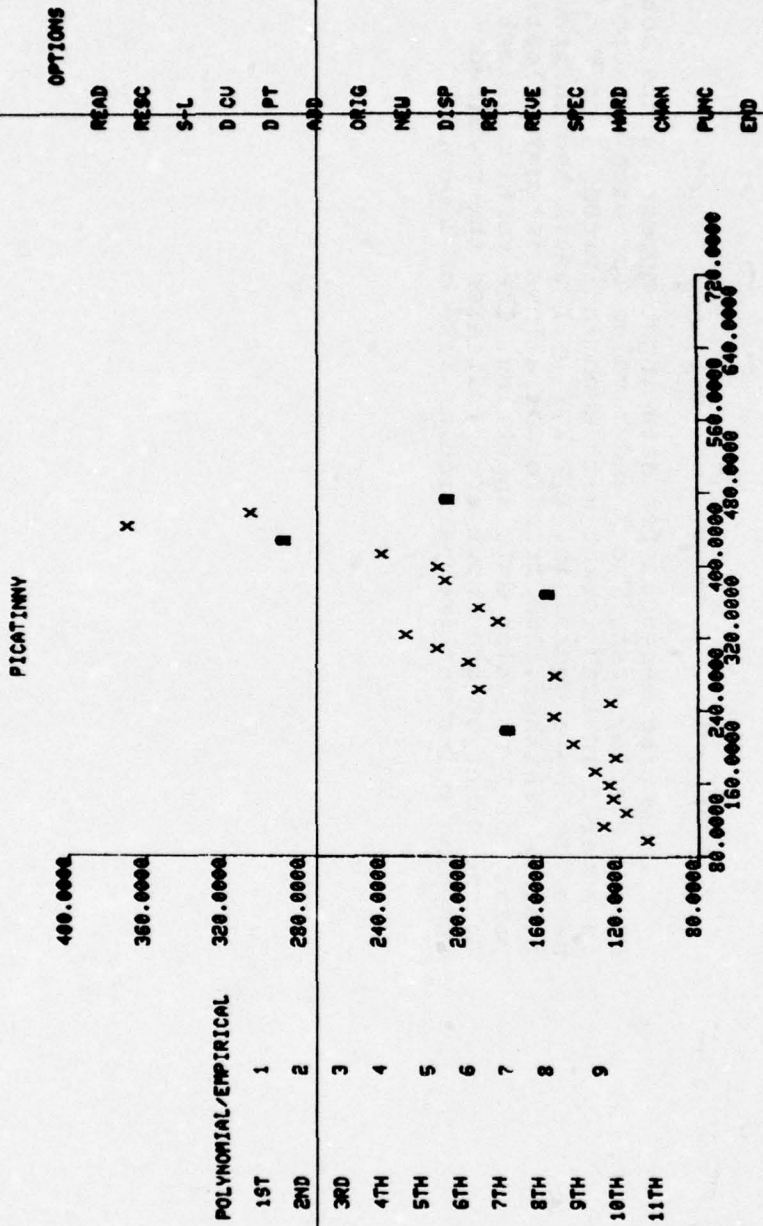
CURVE  
 A .  
 B .  
 C .  
 STAND. ERROR  
 OF ESTIMATE  
 COEFFICIENT OF  
 DETERMINATION

Restore a point to the data set by placing the cross-hairs over its "O" and depress any key. Immediately a "\$" appears over the "O" meaning that this point has been returned to the data set. Future calculations will now include this point. Continue to re-position the cross-hairs if more points need to be restored.



ADD NEW POINT(S)

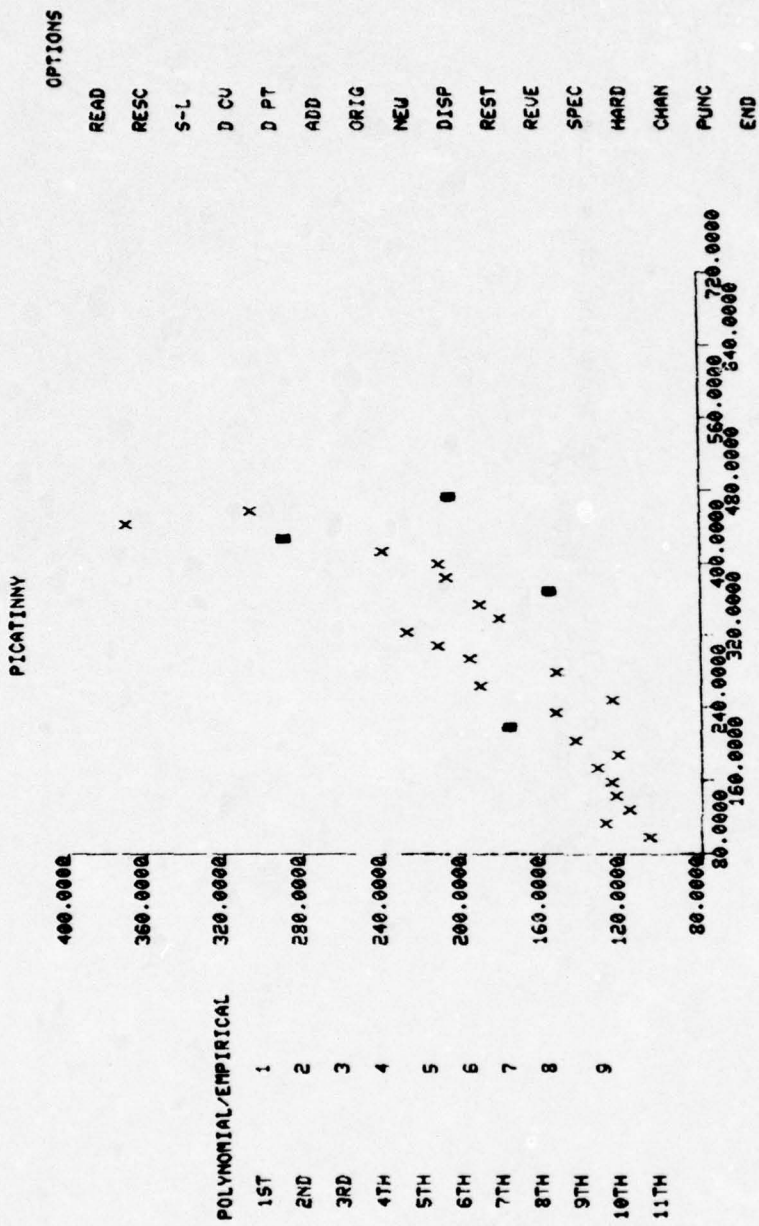
Another way to modify the current data set is to add points. To do this, select the phrase ADD NEW POINT(S) or ADD.



NO. OF POINTS = 26 22  
BEST FIT

CURVE  
A -  
B -  
C -  
STAND. ERROR  
OF ESTIMATE -  
COEFFICIENT OF  
DETERMINATION -

Prompting messages for data input appear at the bottom of the display area. The X and Y value for each data point is entered in free format with each individual X or Y separated by a comma (ie. X,Y,X,Y,...) until the desired list is finished. The free format allows integer, floating point, or E notation data inputting. The vertical slash on the right of the input area indicates the required stopping point for the particular line of input.

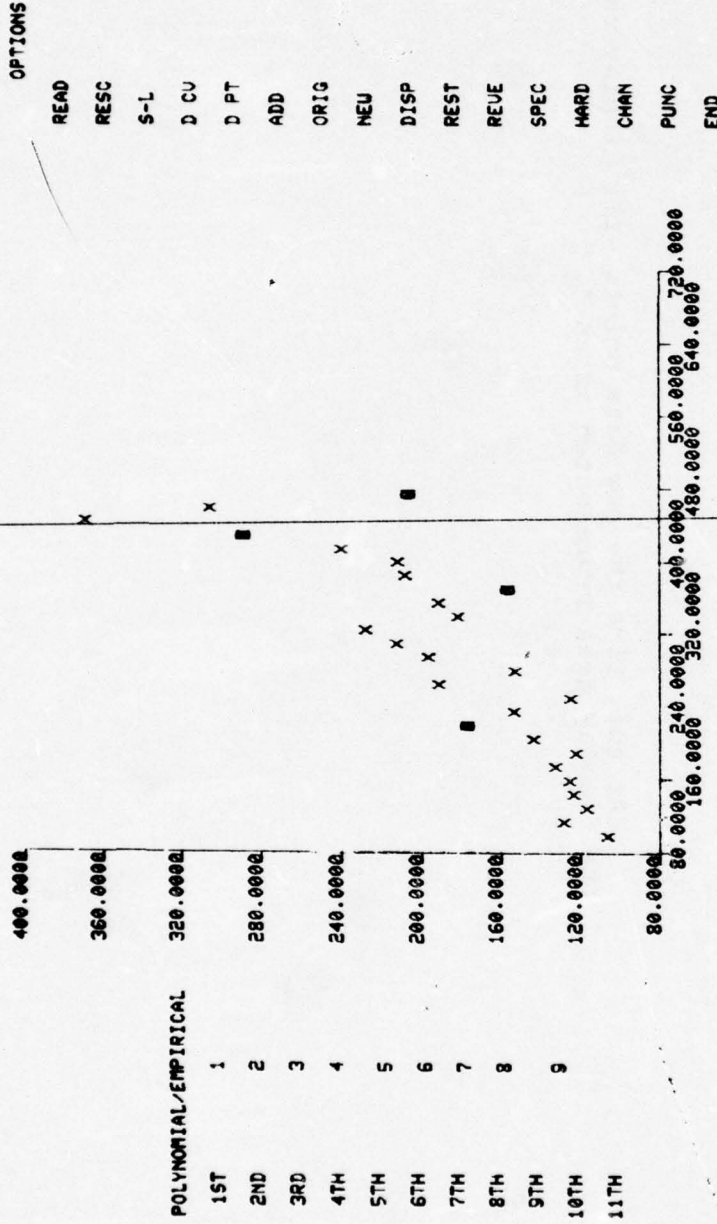


CURVE  
 A =  
 B =  
 C =  
 STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =

END OF LINE  
 END OF DATA  
 PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.

If the data is complete prior to reaching this line,  
select the phrase END OF DATA.

PICATINNY



NO. OF POINTS = 26 22 24  
BEST FIT

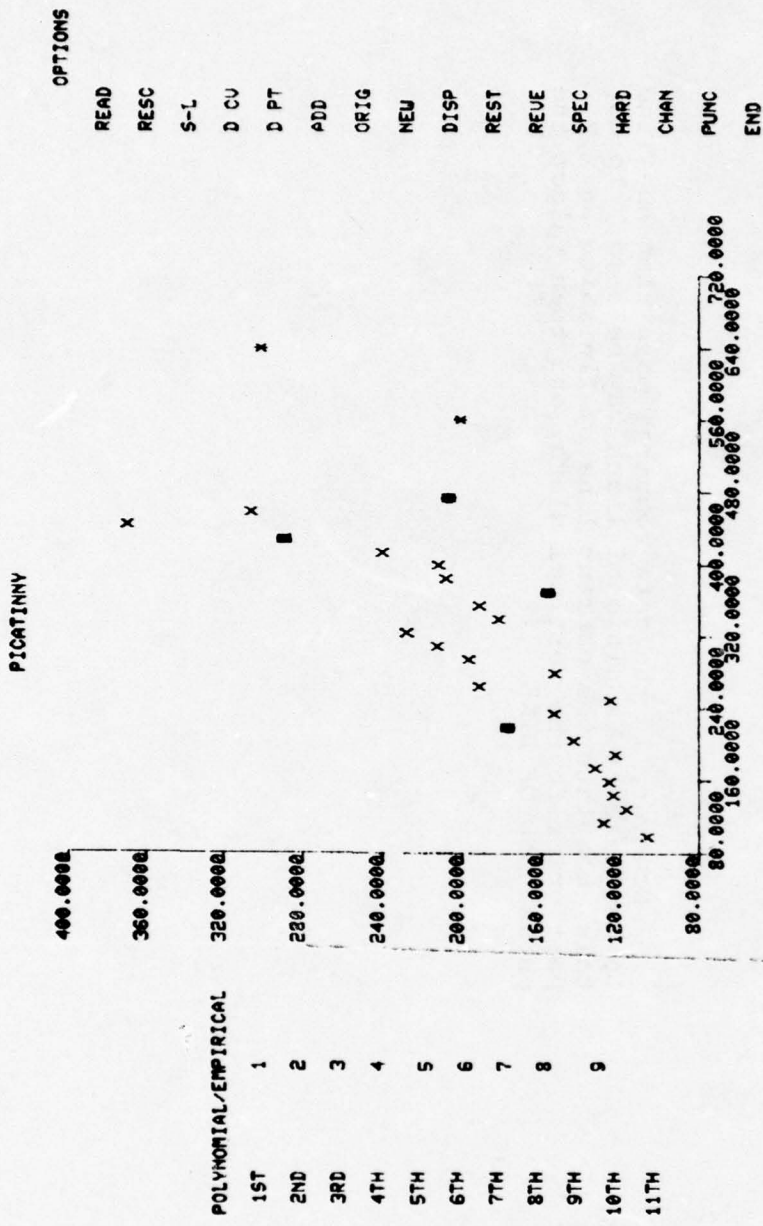
CURVE

- A .
- B .
- C .

STAND. ERROR  
OF ESTIMATE  
COEFFICIENT OF  
DETERMINATION

END OF LINE  
END OF DATA  
PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
560,200,640,300,

At this time the new data points will display onto  
the display area represented as an \*.



CURVE  
A \*  
B \*  
C \*

STAND. ERROR  
OF ESTIMATE  
COEFFICIENT OF  
DETERMINATION

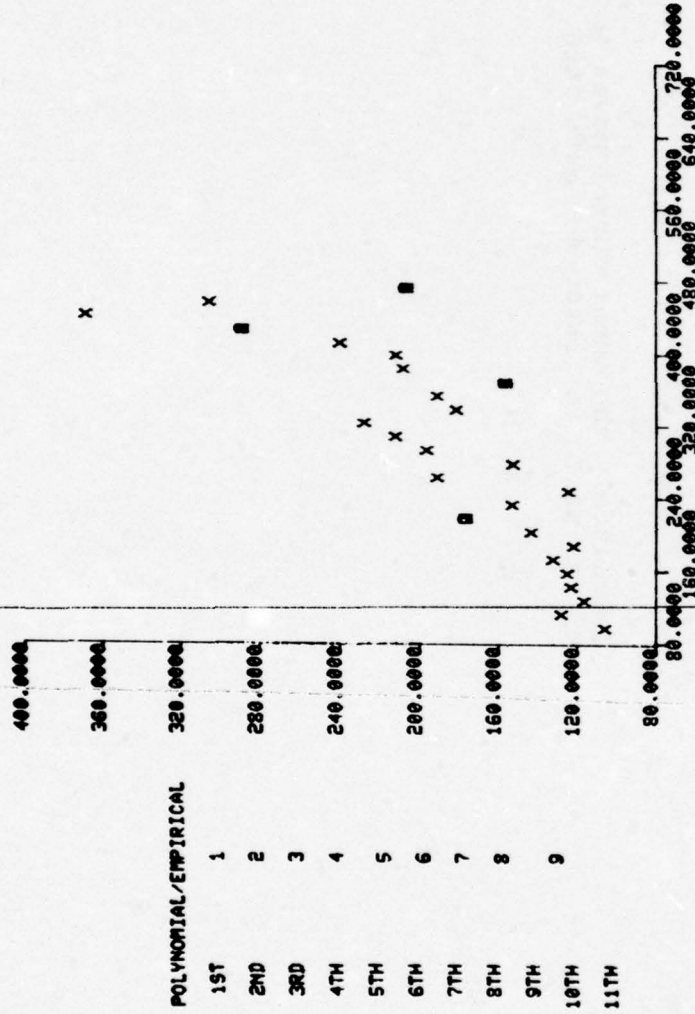
END OF LINE  
PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
560,200,640,300,

However, if the data requires more than one line to complete it, additional lines may be used. To do this, complete the current line by finishing an X,Y pair prior to the vertical slash, and then select the phrase END OF LINE.

PICATINNY

OPTIONS

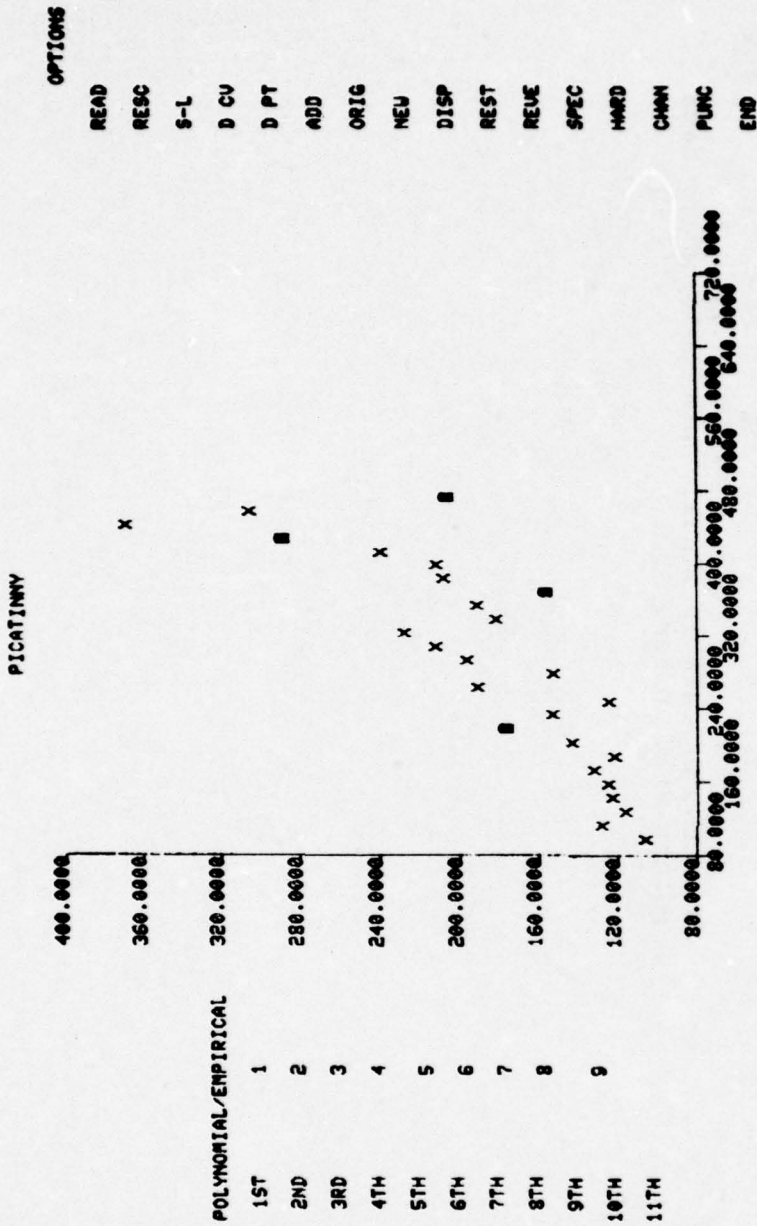
READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEW  
 DISP  
 REST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END



NO. OF POINTS = 26 22 24  
 BEST FIT

END OF LINE  
 END OF DATA  
 PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
 560,90,560,110,560,120,560,130,560,140,560,150,560,160,560,170,

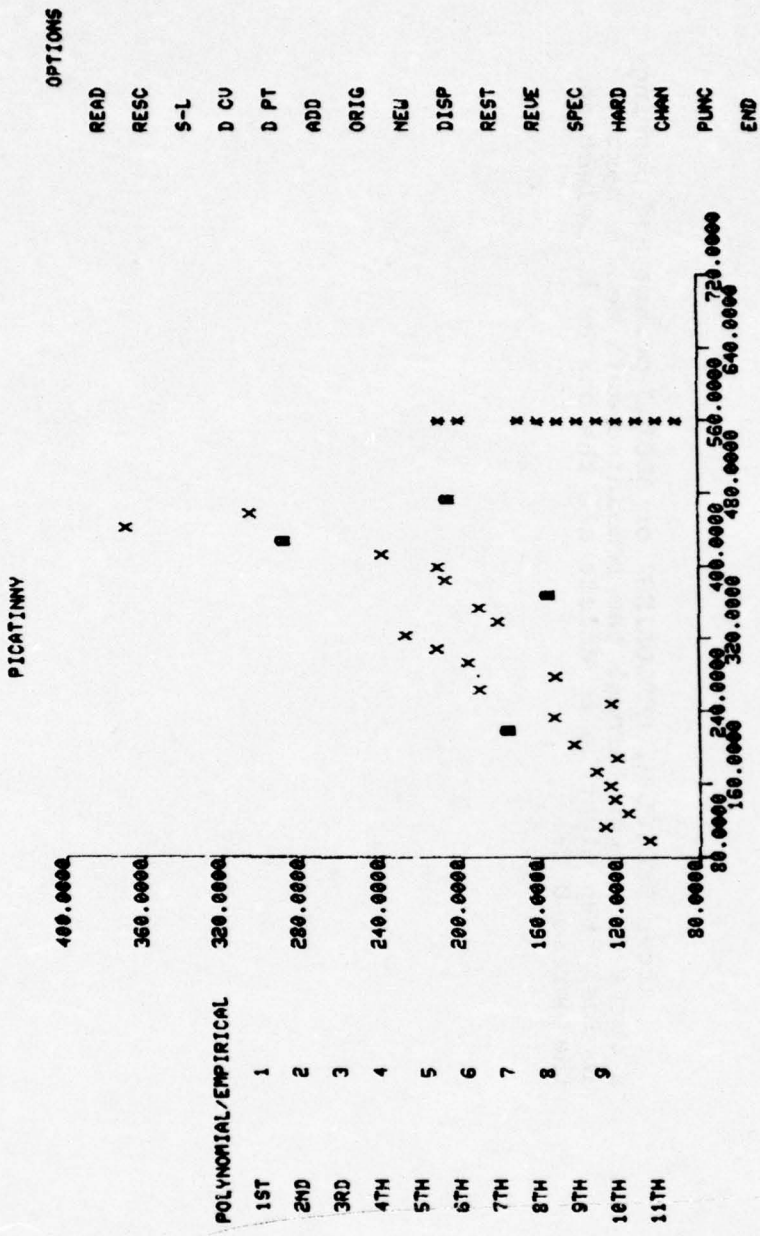
Immediately the input cursor moves to the beginning  
of the next line ready for more data.



CURVE  
 A =  
 B =  
 C =  
 STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =

END OF LIME  
 END OF DATA  
 PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
 560,80,560,100,560,110,560,120,560,130,560,140,560,150,560,160,560,170,  
 560,200,560,210,

When END OF DATA is finally selected the new data points will appear.

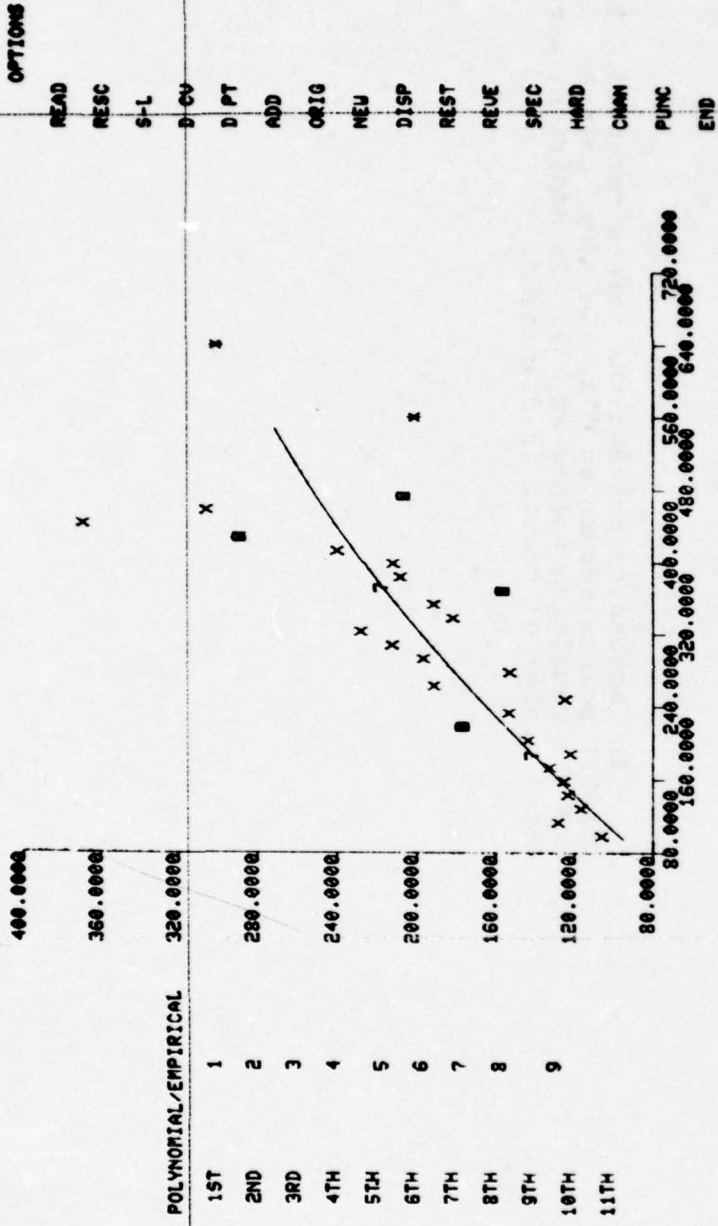


CURVE  
A .  
B .  
C .  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

END OF LINE  
END OF DATA  
PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
560,000,560,100,560,110,560,120,560,130,560,140,560,150,560,160,560,170,  
560,200,560,210.

After DELETING, RESTORING, or ADDING points and passing a curve or curves through the remaining data set, a next logical step might be to delete all the curves by selecting the phrase D CV:

PICATINNY

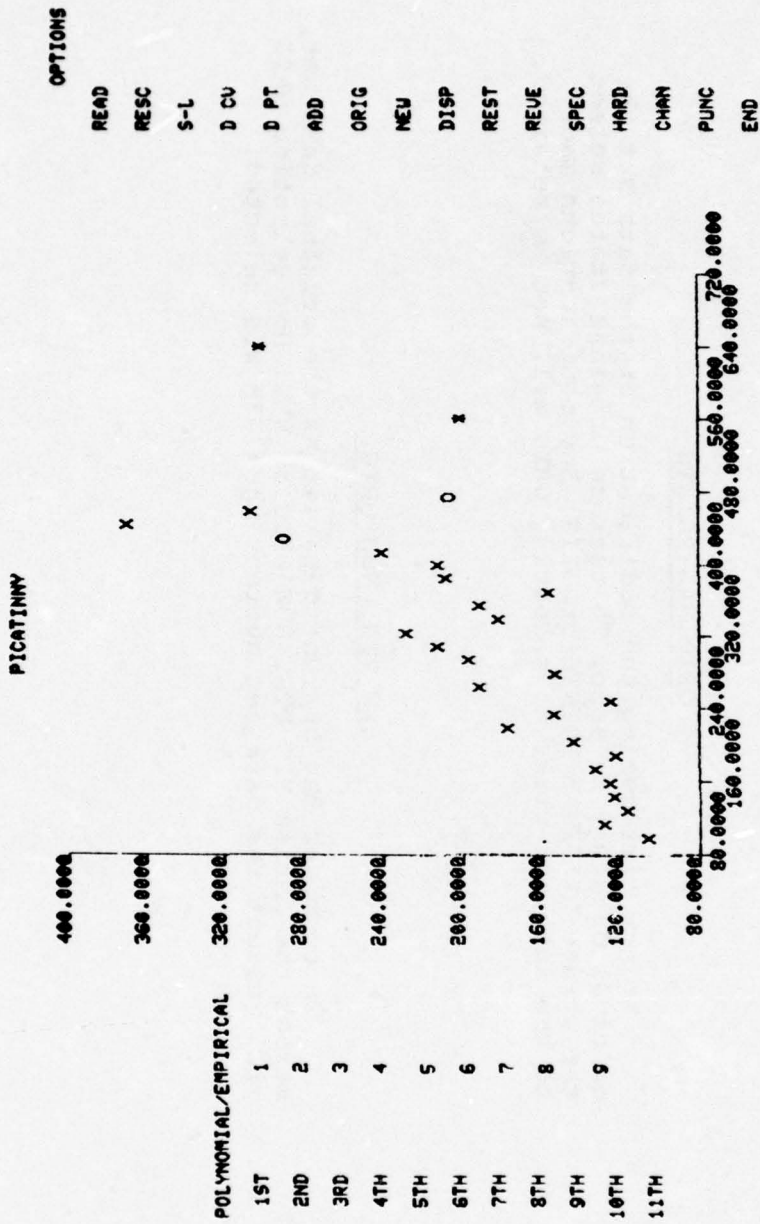


NO. OF POINTS = 26 22 24 26  
 BEST FIT = 7

CURVE 7  
 A = 42.8311  
 B = .5798  
 C = -.0003  
 STAND. ERROR  
 OF ESTIMATE = 37.2693  
 COEFFICIENT OF  
 DETERMINATION = .6588

END OF LINE  
 END OF DATA  
 PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
 500,200,640,300,

The screen clears and the points returned. The DELETED points return as O's, the ADDED points as #'s and the remaining points as X's. In addition, a new total number of points is displayed.



NO. OF POINTS • 26  
BEST FIT •

CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

IV. OTHER OPTIONS

ORIGINAL POINTS

At any time during the modification of the data set the original data may be seen. To restore original status select the phrase ORIGINAL POINTS or ORIG. Any modifications made to the data set prior to selecting ORIG will not be retained.

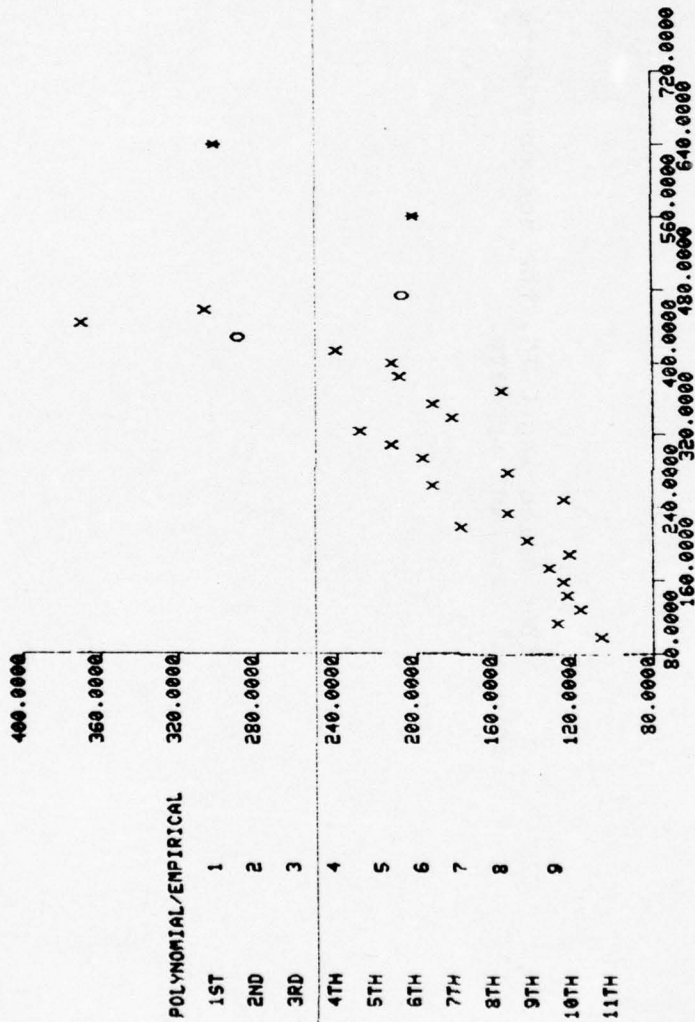
NEW PTS. NOW ORIG.

To consider the current data set as the original data set, select the phrase NEW PTS. NOW ORIG or NEW. Now selecting ORIG will reflect the data set current when NEW was selected.

PICATINNY

OPTIONS

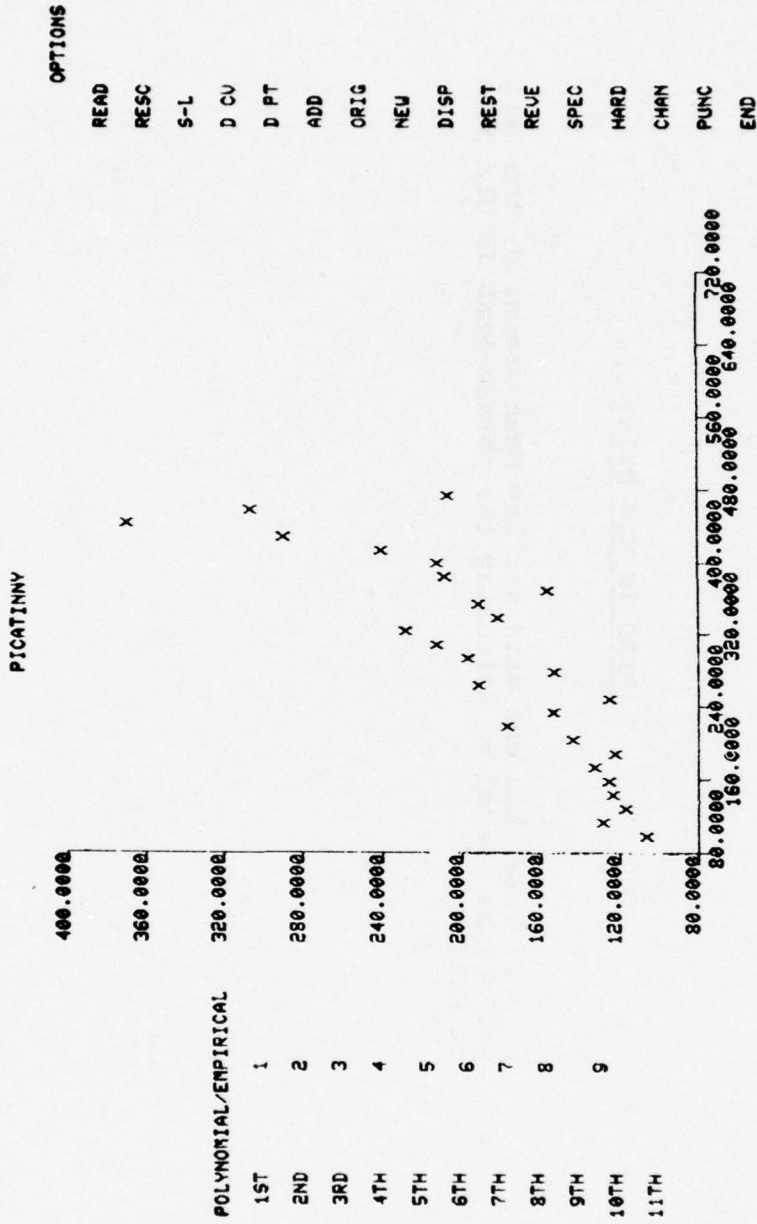
READ  
 RESC  
 S+L  
 DICU  
 DIPT  
 APD  
 ORIG  
 NEU  
 DISP  
 REST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END



NO. OF POINTS - 26  
 BEST FIT -

CURVE  
 A -  
 B -  
 C -  
 STAND. ERROR  
 OF ESTIMATE -  
 COEFFICIENT OF  
 DETERMINATION -

After selecting ORIG, the screen clears and the current original data set appears.



NO. OF POINTS = 26  
 BEST FIT =

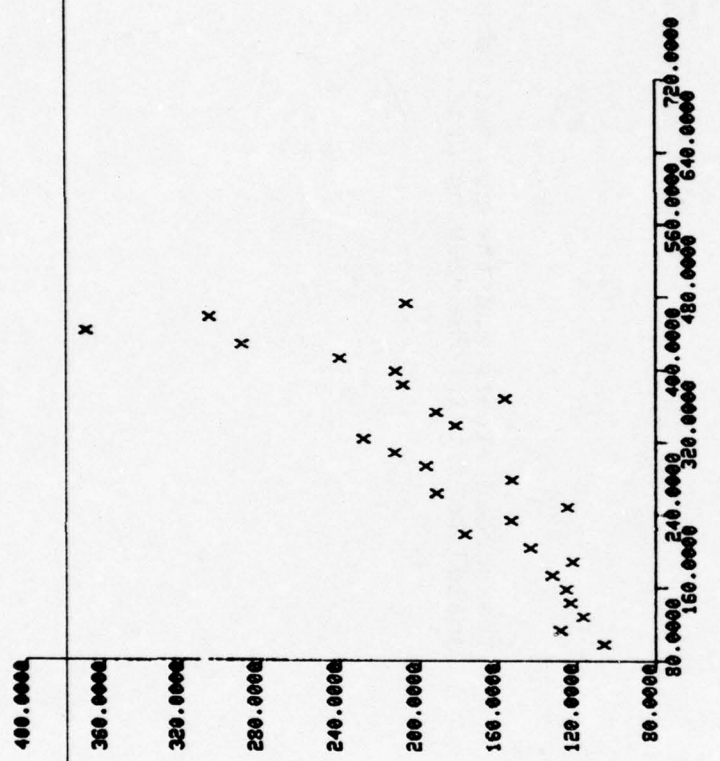
READ IN NEW DATA

If more than one data set has been prepared, the next set may be viewed by selecting the phrase READ IN NEW DATA or READ.

PICATINNY

OPTIONS

READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEW  
 DISP  
 RGST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PLNC  
 END

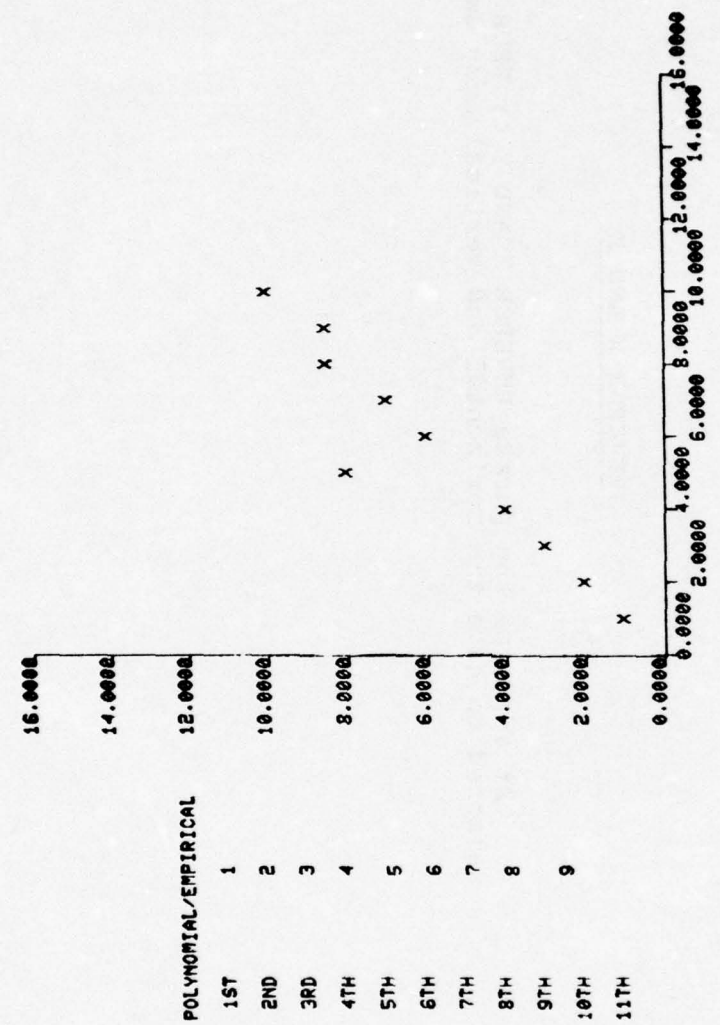


NO. OF POINTS = 26  
 BEST FIT

CURVE  
 A :  
 B :  
 C :  
 STAND. ERROR  
 OF ESTIMATE  
 COEFFICIENT OF  
 DETERMINATION

The screen clears and the new data appears properly scaled to fit in the viewing axis.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT -

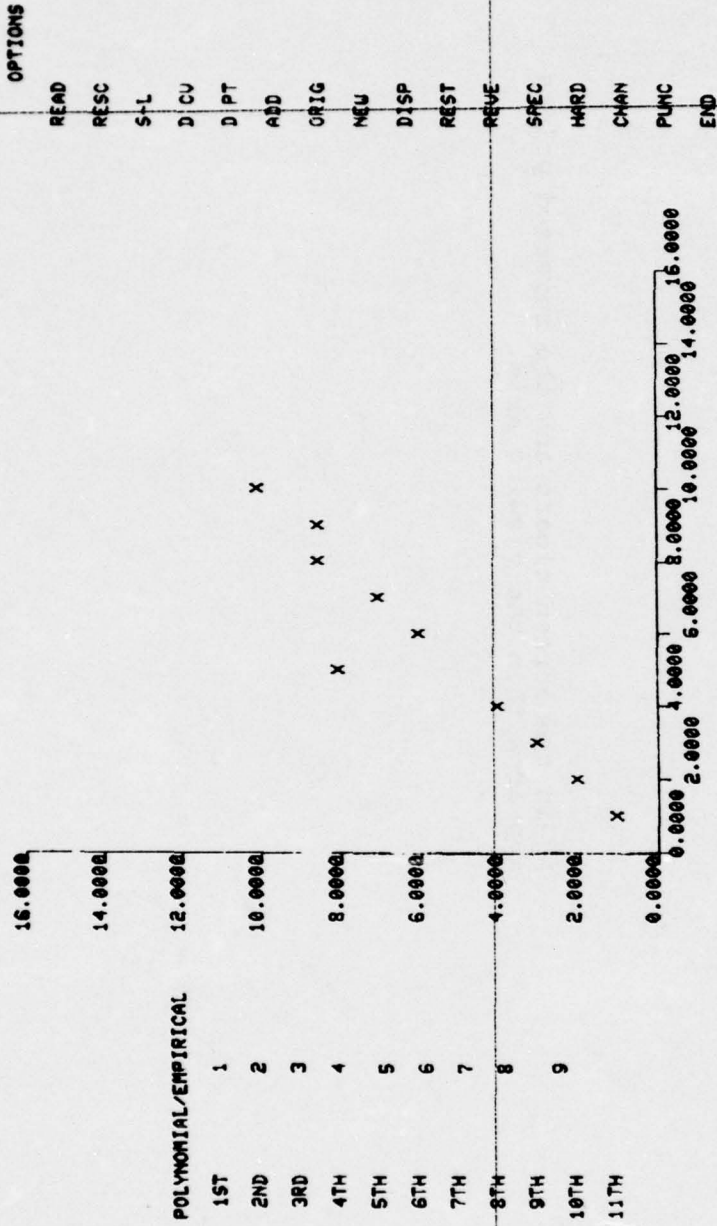
CURVE  
A -  
B -  
C -  
STAND. ERROR  
OF ESTIMATE -  
COEFFICIENT OF  
DETERMINATION -

OPTIONS  
READ  
RESC  
S-L  
D CU  
D PT  
ADD  
ORIG  
NEU  
DISP  
REST  
REVE  
SPEC  
HARD  
CHAN  
PUNC  
END

REVERSE X AND Y

At any time the phrase REVERSE X AND Y or REVE may be selected to have the horizontal and vertical axes switched.

TEST DATA 3

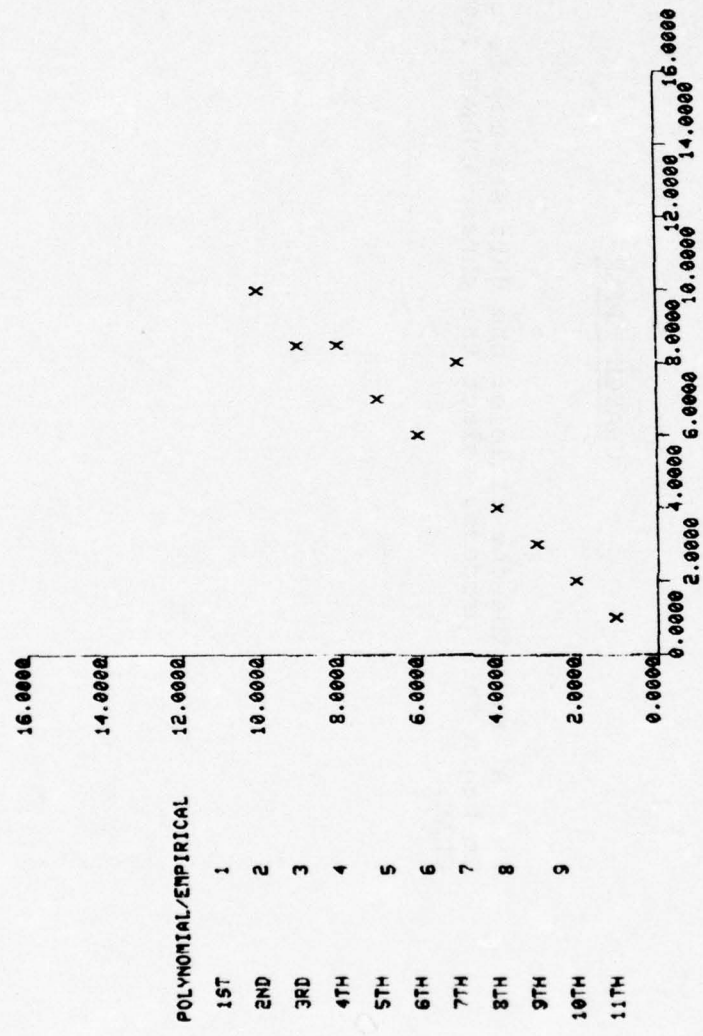


NO. OF POINTS = 10  
 BEST FIT =

Again the screen clears and the reversed points appear within the viewing axis.

TEST DATA 3

OPTIONS  
 READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEW  
 DISP  
 REST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END



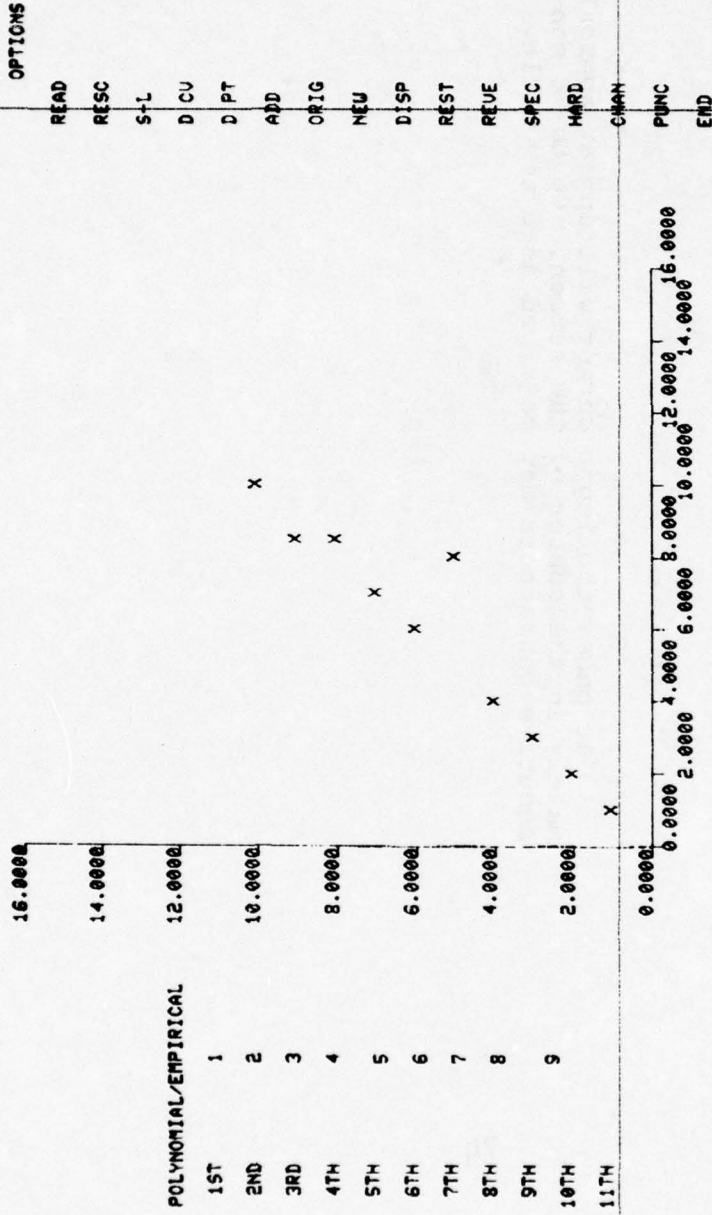
NO. OF POINTS = 10  
 BEST FIT =

CURVE  
 A =  
 B =  
 C =  
 STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =

CHANGE TITLE

At any time the title of the data set may be changed.  
To begin this process, select the phrase CHANGE TITLE or  
CHAN.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT =

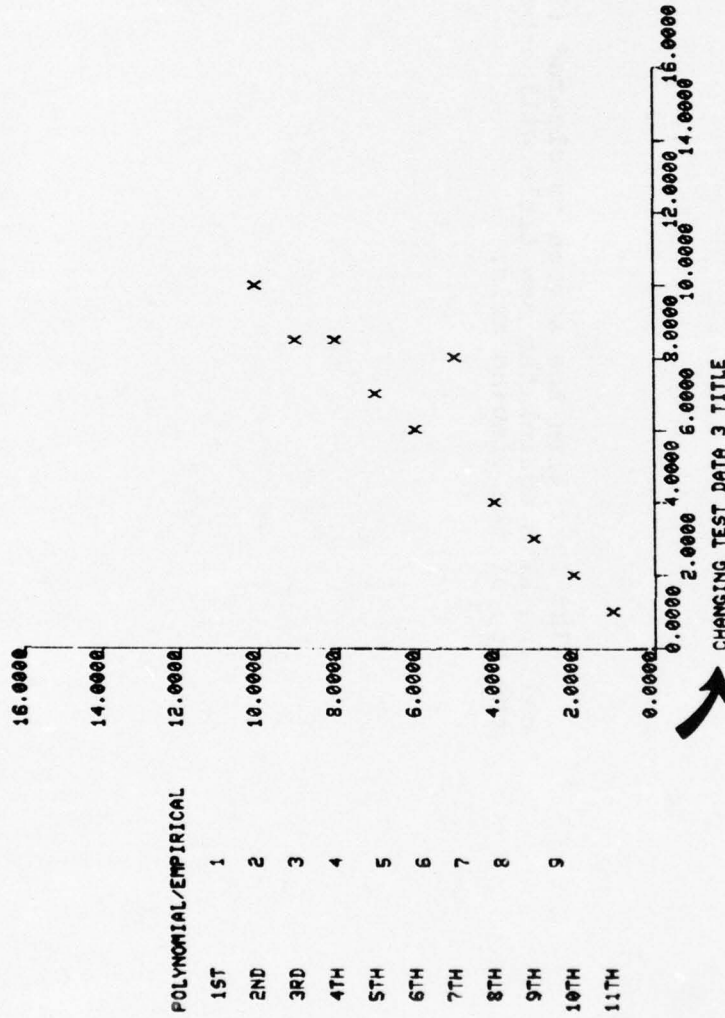
CURVE  
A -  
B -  
C -  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

At once, the input cursor will appear approximately in the center of the screen. Up to 70 consecutive characters may be typed as a new title.

OPTIONS

READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEU  
 DISP  
 REST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END

TEST DATA 3



NO. OF POINTS = 10  
 BEST FIT

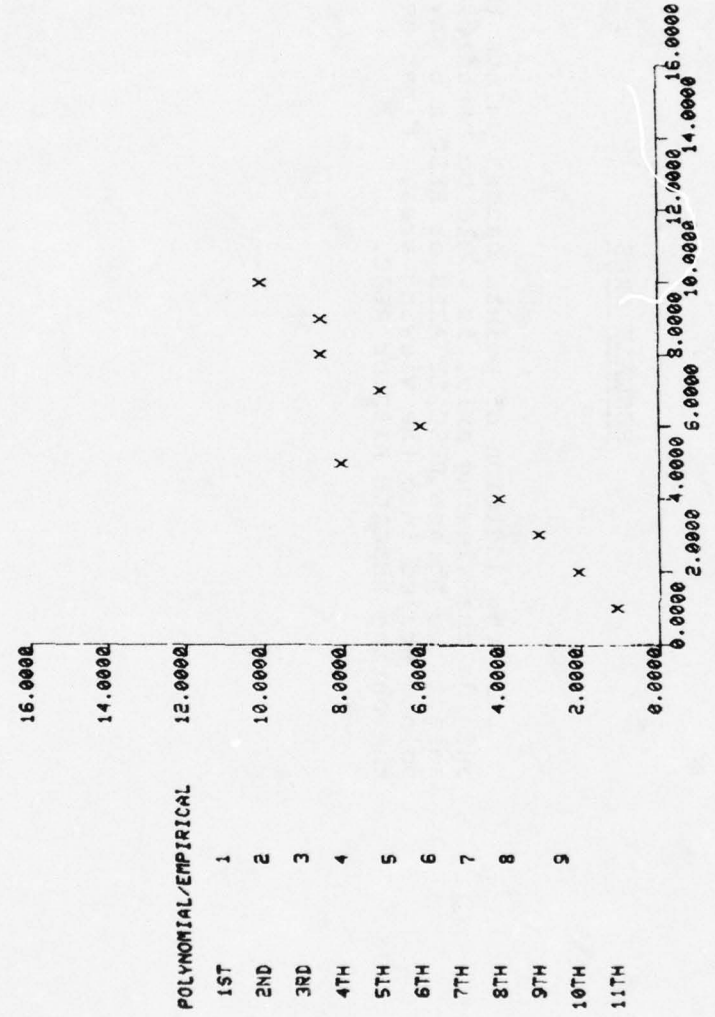
CURVE

A =  
 B =  
 C =

STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =

The next time the screen is cleared (i.e. by calling REVE again) the new title will appear at the top of the viewing axis.

CHANGING TEST DATA 3 TITLE



NO. OF POINTS = 10  
BEST FIT

CURVE  
A  
B  
C  
STAND. ERROR  
OF ESTIMATE  
COEFFICIENT OF  
DETERMINATION

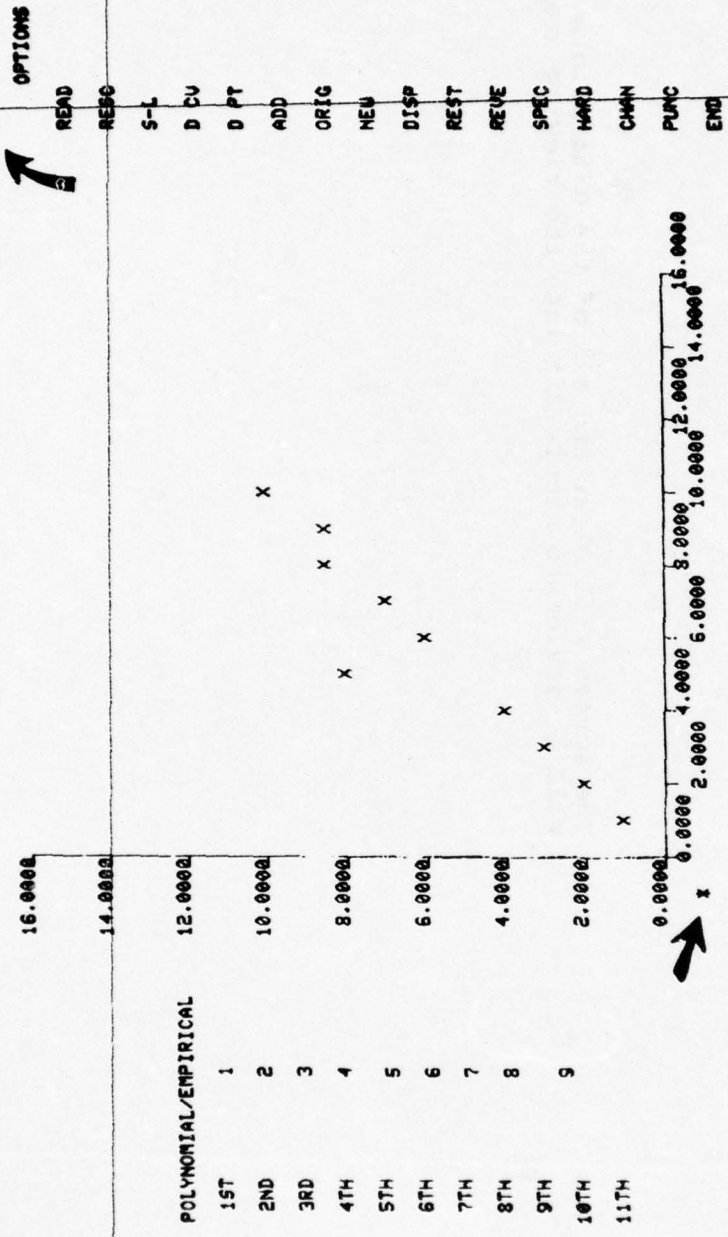
OPTIONS

READ  
RESC  
S-L  
D CV  
D PT  
ADD  
ORIG  
NEW  
DISP  
REST  
REVE  
SPEC  
HARD  
CHAN  
PUNC  
END

RESCALE AXES

If the addition of points causes points to lie outside the viewing axis, it would be beneficial to select the phrase RESCALE AXES or RESC and have these points scaled into the viewing area. First select the phrase RESCALE AXES or RESC.

CHANGING TEST DATA 3 TITLE



NO. OF POINTS = 10 12  
BEST FIT

CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

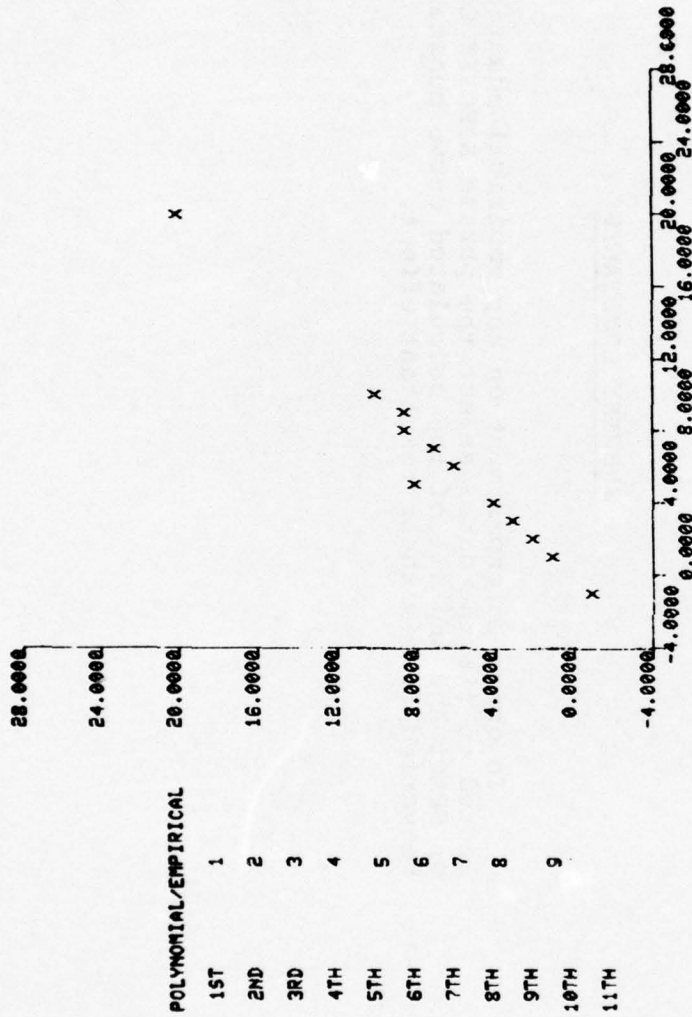
END OF LINE  
PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
-1,-1,20,20,

The screen will clear and all of the data points  
will be scaled to nicely fit into the viewing area.

CHANGING TEST DATA 3 TITLE

OPTIONS

READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEU  
 DISP  
 REST  
 REVE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END



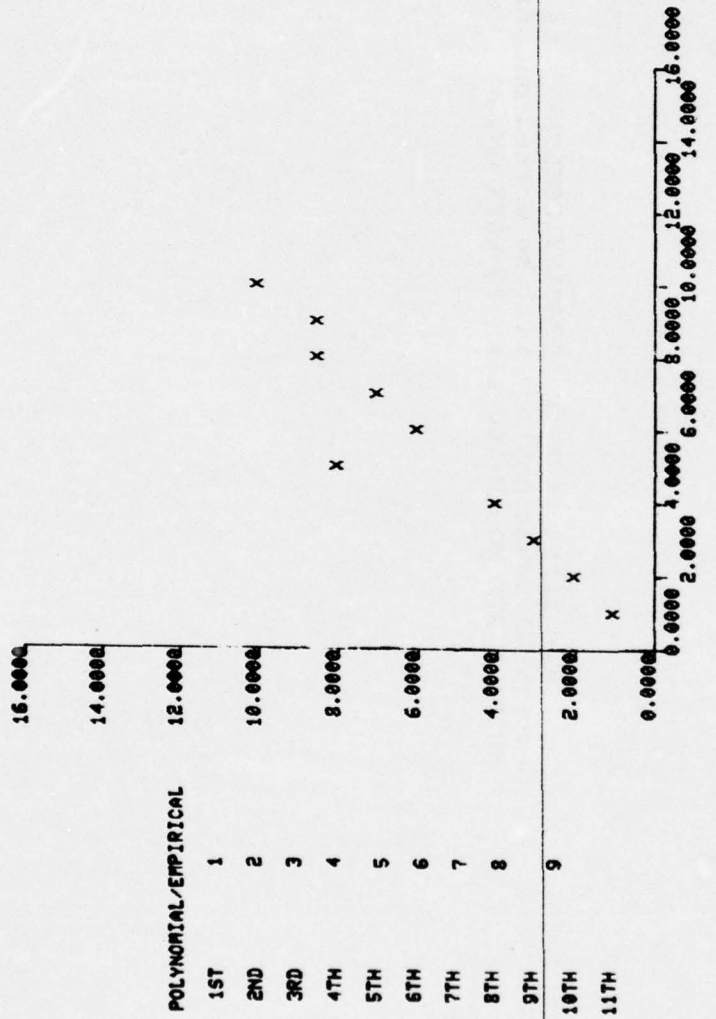
NO. OF POINTS = 12  
 BEST FIT =

CURVE  
 A =  
 B =  
 C =  
 STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =

SPECIFY CONSTANTS

In order to experiment on any empirical equation selected to fit the data, select the phrase SPECIFY CONSTANTS or SPEC. Any and all of the calculated curve constants may be varied to see their resultant effect.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT

CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

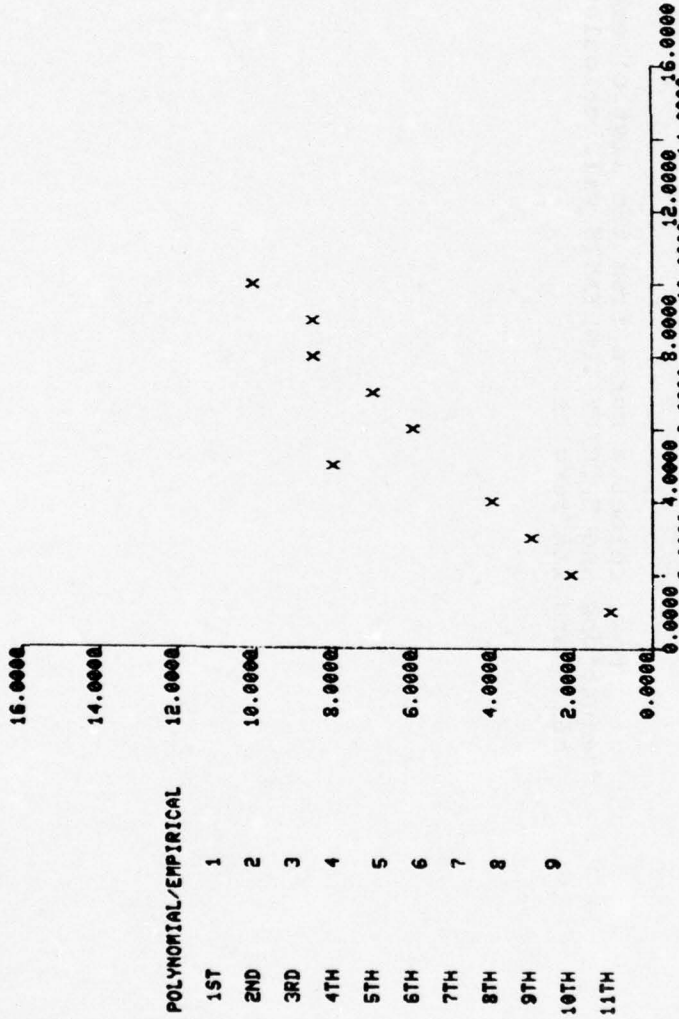
OPTIONS

READ  
RESC  
S-L  
D DU  
D PT  
ADD  
ORIG  
NEW  
DISP  
REST  
REVE  
SPEC  
HARD  
CHAN  
PUNC  
END

The first task for SPECIFY CONSTANTS is to obtain the empirical equation that will be worked on. The program asks WHICH CURVE WOULD YOU LIKE TO WORK ON.

OPTIONS  
 READ  
 RESC  
 S-L  
 D CU  
 D PT  
 ADD  
 ORIG  
 NEU  
 DISP  
 REST  
 REUE  
 SPEC  
 HARD  
 CHAN  
 PUNC  
 END

TEST DATA 3



NO. OF POINTS = 10  
 BEST FIT =

CURVE

- A .
- B .
- C .

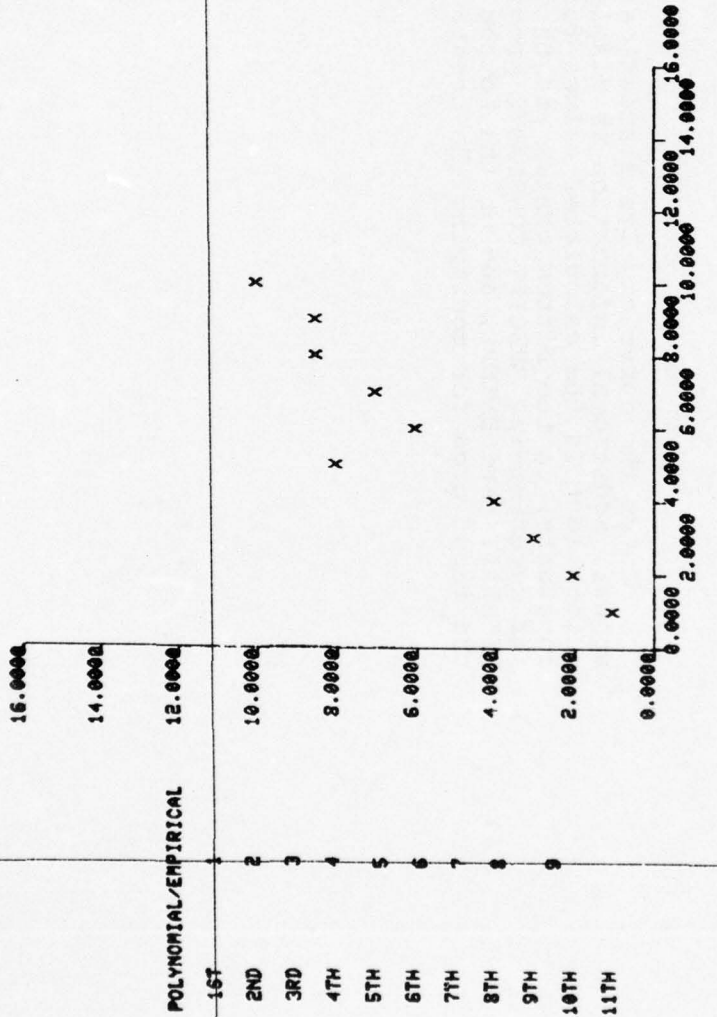
STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =



WHICH CURVE WOULD YOU LIKE TO WORK ON

Now, select a curve from the list of empirical equations and SPECIFY CONSTANTS will calculate the curve and its results.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT .

CURVE  
A :  
B :  
C :  
STAND. ERROR  
OF ESTIMATE  
COEFFICIENT OF  
DETERMINATION

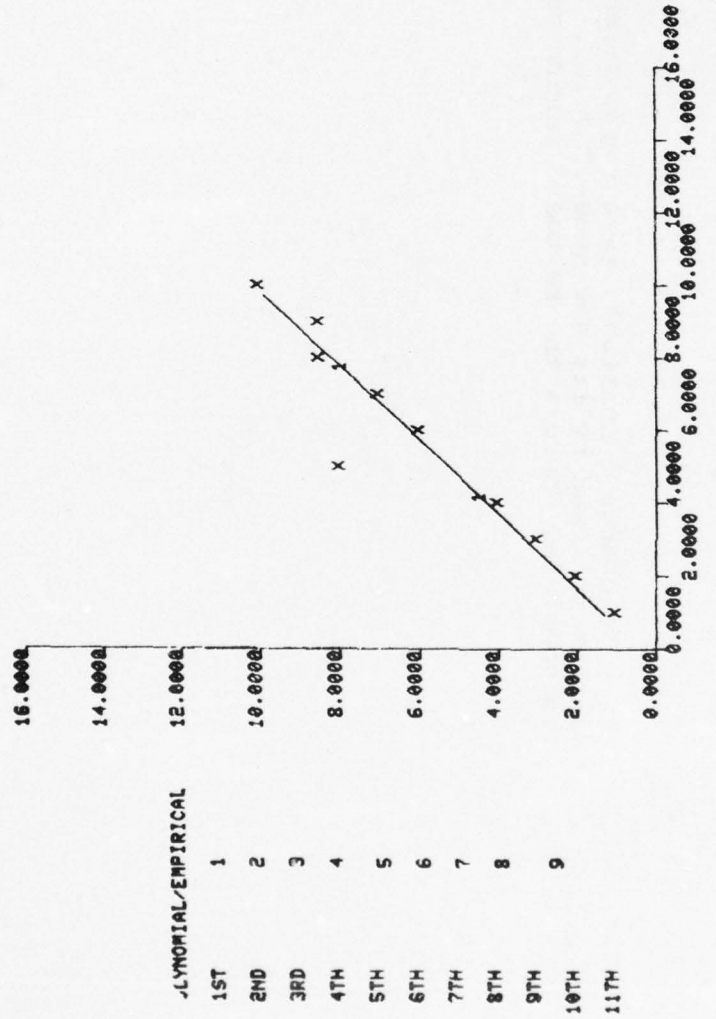
OPTIONS

- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEW
- DISP
- REST
- REVE
- SPEC
- HARD
- CHAN
- PUNC
- END

WHICH CURVE WOULD YOU LIKE TO WORK ON

After the curve and its statistical results appear, additional information is displayed. On the bottom left is the calculated values for the curve constants; in the bottom center are three phrases for determining SPECIFY CONSTANTS program flow (DONE, DISPLAY, and ENTER), and on the bottom right is the input area for modifying the constants.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR

A	.4333
B	.9758

CURVE 1

A	.4333
B	.9758
C	

STAND. ERROR OF ESTIMATE = .9247  
COEFFICIENT OF DETERMINATION = .9018

DONE  
DISPLAY  
ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

OPTIONS

- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEW
- DISP
- REST
- REVE
- SPEC
- HARD
- CHAM
- PLMC
- END

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER

AD-A031 854

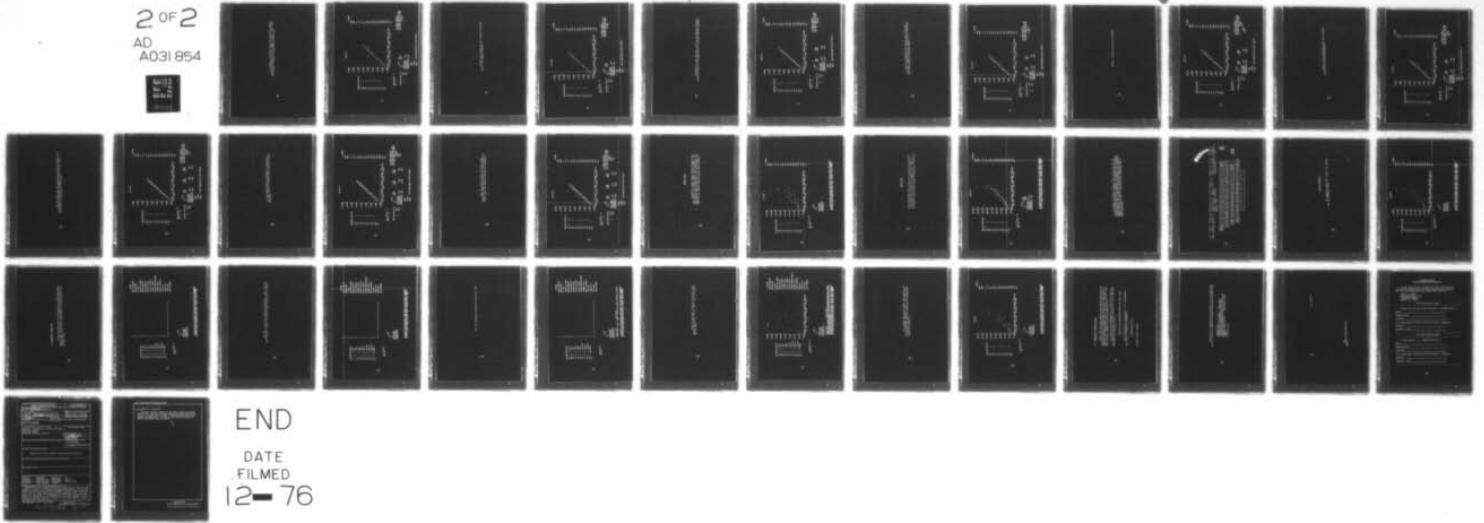
PICATINNY ARSENAL DOVER N J MANAGEMENT INFORMATION S--ETC F/G 9/2  
GRAFTEK - GRAFFIT CURVE FITTING PROGRAM TEKTRONIX VERSION.(U)  
SEP 76 W D LUNGER

UNCLASSIFIED

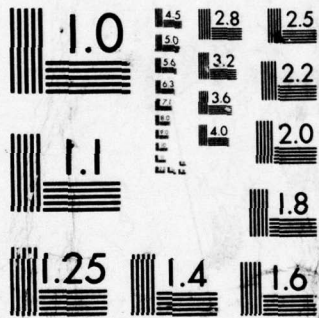
MISD-UM-76-3

NL

2 OF 2  
AD  
A031 854



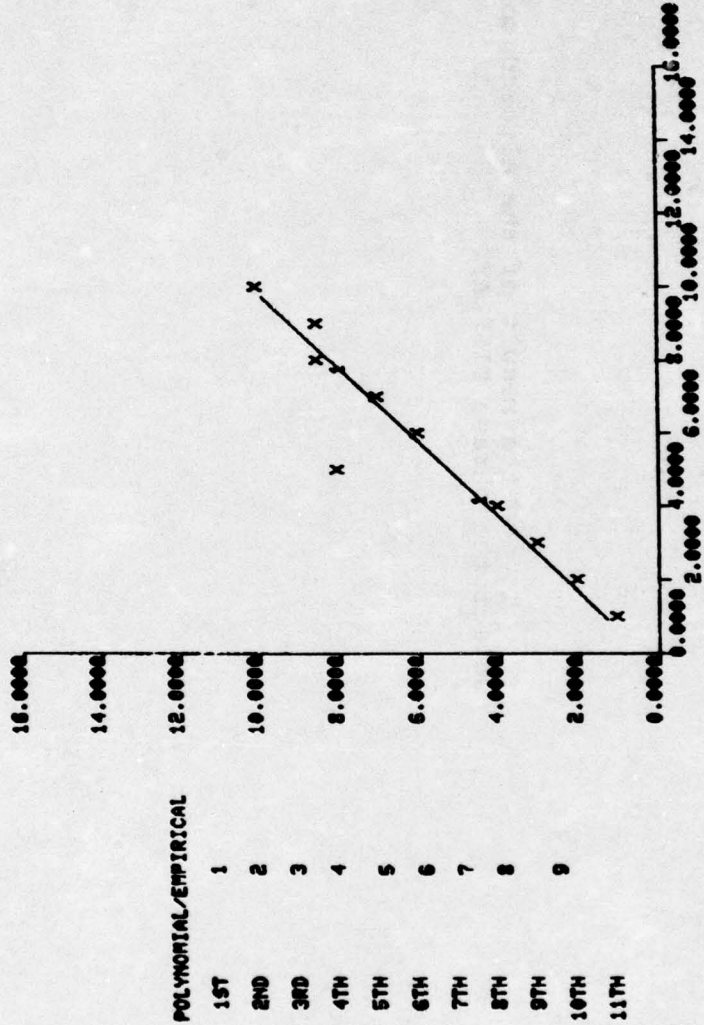
END  
DATE  
FILMED  
12-76



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

To change a constant, type the desired constant letter followed by its new numeric value. When input is complete, depress the keyboard return key.

TEST DATA 3



OPTIONS

- READ
- RESC
- 9-1
- D CV
- D PT
- ADD
- ORIG
- NEU
- DISP
- REST
- REUE
- SPEC
- HARD
- CHAN
- PUNC
- END

NO. OF POINTS = 10  
BEST FIT = 1

CURVE 1  
A = .4333  
B = .9758  
C =  
STAND. ERROR OF ESTIMATE = .9847  
COEFFICIENT OF DETERMINATION = .9918

CALCULATED VALUE FOR  
A .4333  
B .9758

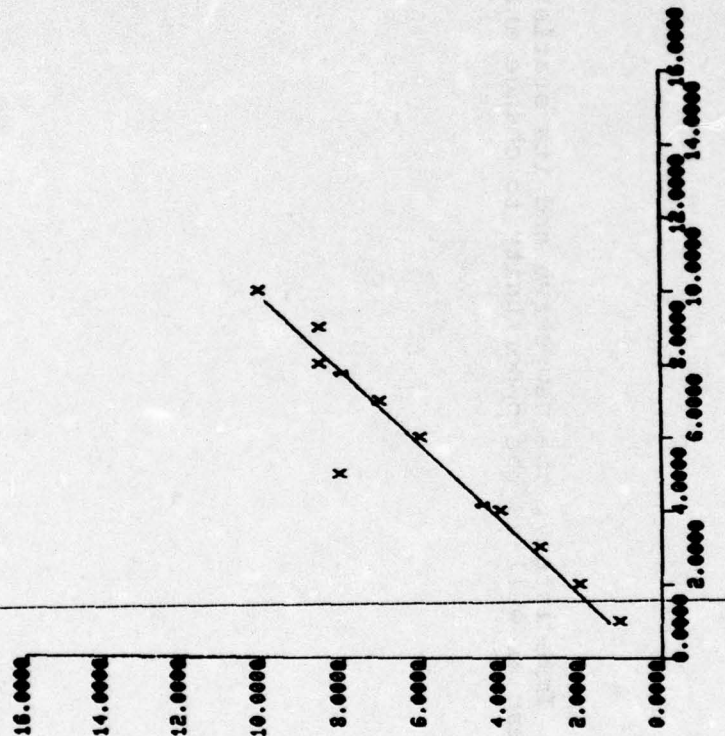
- DONE
- DISPLAY
- ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-91.005

To see the result of the altered constant,  
select the phrase DISPLAY.

TEST DATA 3



POLYNOMIAL/EMPIRICAL

- 1ST 1
- 2ND 2
- 3RD 3
- 4TH 4
- 5TH 5
- 6TH 6
- 7TH 7
- 8TH 8
- 9TH 9
- 10TH
- 11TH

NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR

A .4333  
B .9758

STAND. ERROR  
OF ESTIMATE = .9847  
COEFFICIENT OF  
DETERMINATION = .9818

CURVE 1

A = .4333  
B = .9758

DONE

DISPLAY

ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

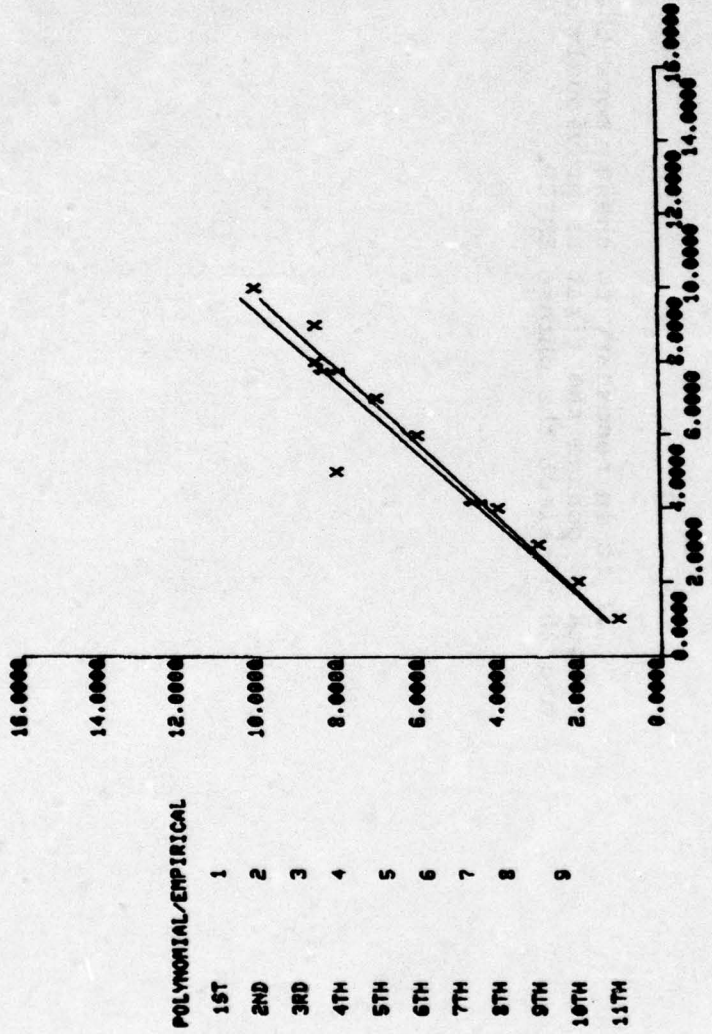
OPTIONS

- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEU
- DISP
- REST
- REVE
- SPEC
- HARD
- CHAN
- PLNC
- END

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-91.005

Immediately, the new curve and its statistical results appear as well as the opportunity to change another constant.

TEST DATA 3



OPTIONS

- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEU
- DISP
- REST
- REVE
- SPEC
- HARD
- CHRN
- PLNC
- END

NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR

A .4333  
B .9758

STAND. ERROR  
OF ESTIMATE = .9847  
COEFFICIENT OF  
DETERMINATION = .9918

CURVE 1  
A = .4333  
B = .9758  
C = 1  
STAND. ERROR  
OF ESTIMATE = .9739  
COEFFICIENT OF  
DETERMINATION = 1.0036

DONE

DISPLAY

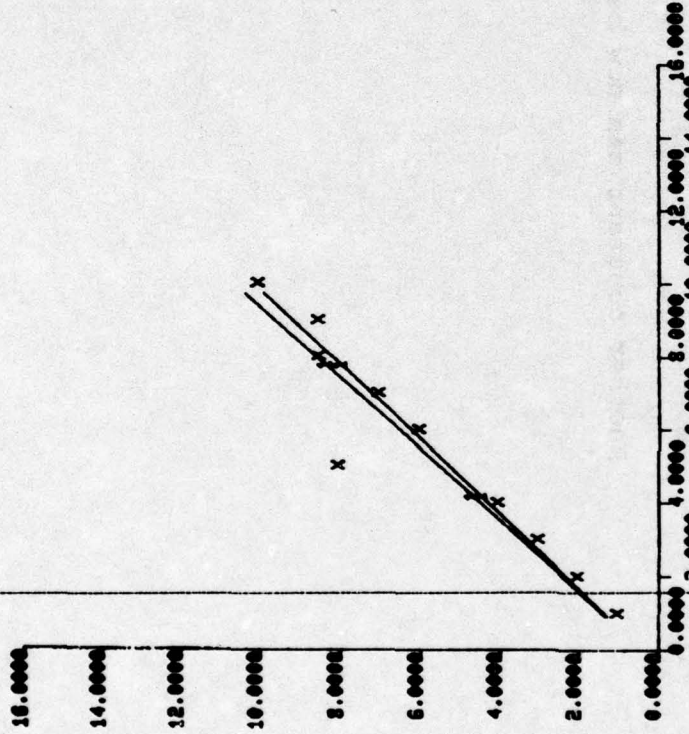
ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-91.005

If it is necessary to change more than one constant, change the first as previously described and then select the phrase ENTER.

TEST DATA 3



OPTIONS

- READ
- RESG
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEW
- DISP
- REST
- REVE
- SPEC
- HARD
- CHAN
- PUNC
- END

TO CHANGE A CONSTANT -  
 TYPE LETTER THEN VALUE, NEXT  
 PICK DONE, DISPLAY, OR ENTER  
 =91.025  
 =91.0

POLYNOMIAL/EMPIRICAL

- 1ST 1
- 2ND 2
- 3RD 3
- 4TH 4
- 5TH 5
- 6TH 6
- 7TH 7
- 8TH 8
- 9TH 9
- 10TH 10
- 11TH 11

NO. OF POINTS = 10  
 BEST FIT = 1

CURVE	1
A	.4333
B	.9758
C	1.0250
STAND. ERROR OF ESTIMATE	.9247
COEFFICIENT OF DETERMINATION	.9918

CALCULATED VALUE FOR

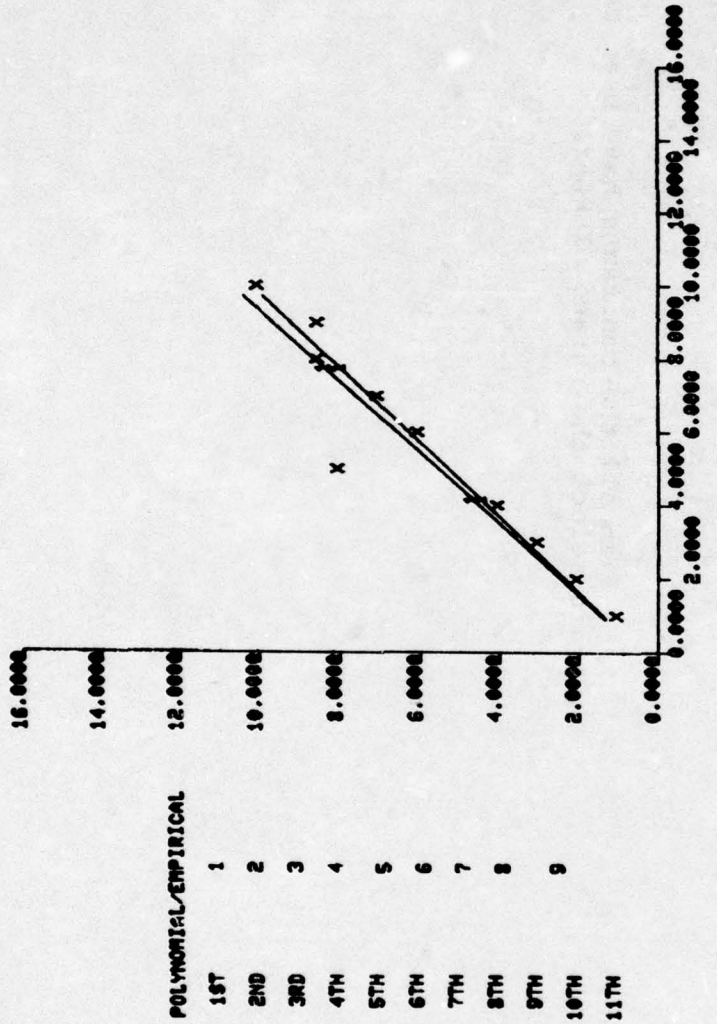
A	.4333
B	.9758

- DONE
- DISPLAY
- ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

Another constant can now be changed.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR  
A .4333  
B .9758

CURVE 1  
A .4333  
B .9758  
C .  
STAND. ERROR OF ESTIMATE .9247  
COEFFICIENT OF DETERMINATION .9918

DONE  
DISPLAY WHICH CURVE WOULD YOU LIKE TO WORK ON  
ENTER

OPTIONS

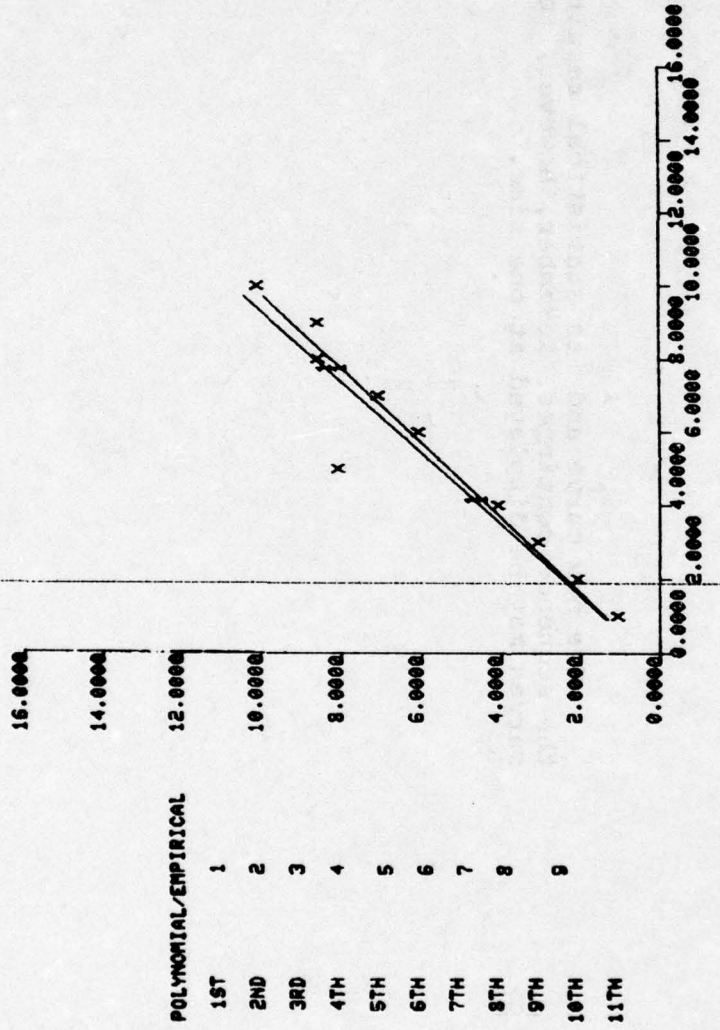
- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEU
- DISP
- REST
- REVE
- SPEC
- HARD
- CHAN
- PUNG
- END

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-91.085  
-91.0



When all the constants have been changed,  
again select the phrase DISPLAY.

TEST DATA 3



NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR

A	.4333
B	.9758

CURVE	1	1
A	.4333	.4333
B	.9758	1.0250
C		
STAND. ERROR		.9739
OF ESTIMATE		
COEFFICIENT OF		
DETERMINATION	.9018	1.0036

DONE  
DISPLAY  
ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

OPTIONS

- READ
- RESC
- S-L
- D CU
- D PT
- ADD
- ORIG
- NEW
- DISP
- REST
- REUE
- SPEC
- HARD
- CHAM
- PUNC
- END

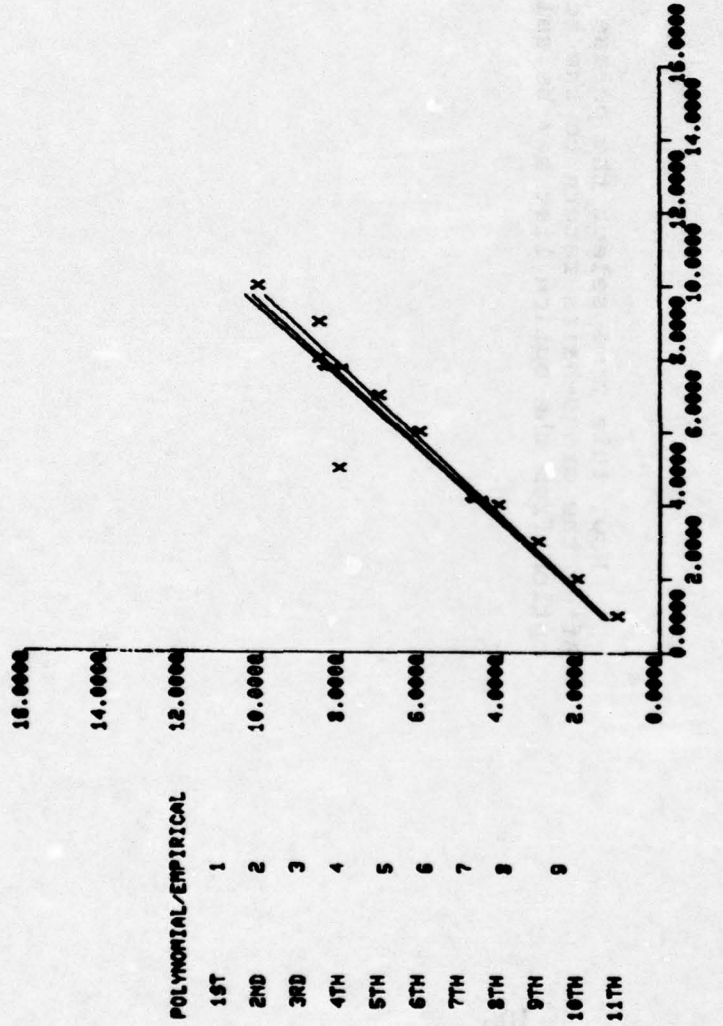
TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-B1.025  
-B1.0  
-A.5

The new curve and its statistical results display and the sequence continues. Remember, however, that only 3 curves may be displayed at one time.



To leave SPECIFY CONSTANTS, first make a constant change as before (any arbitrary value will do).

TEST DATA 3



POLYNOMIAL/EMPIRICAL

- 1ST 1
- 2ND 2
- 3RD 3
- 4TH 4
- 5TH 5
- 6TH 6
- 7TH 7
- 8TH 8
- 9TH 9
- 10TH 10
- 11TH 11

NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR

A .4333  
B .9758

CURVE 1 1  
A : .4333  
B : .9758  
C : 1.0000  
STAND. ERROR OF ESTIMATE = .9847  
COEFFICIENT OF DETERMINATION = .9918

DONE  
DISPLAY WHICH CURVE WOULD YOU LIKE TO WORK ON  
ENTER

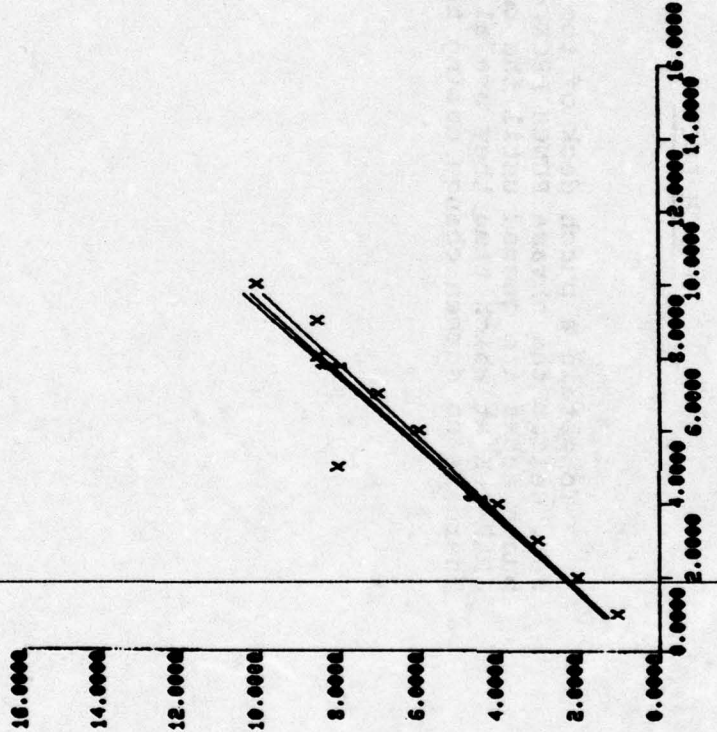
OPTIONS

- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEU
- DISP
- REST
- REVE
- SPEC
- HARD
- CHNN
- PLNC
- END

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-B1.000  
-B1.0  
-A.5  
-AD.

Now, this time select the phrase DONE.  
After the cross-hairs return to the screen any  
option from the option list may be selected.

TEST DATA 3



POLYNOMIAL/EMPIRICAL

- 1ST 1
- 2ND 2
- 3RD 3
- 4TH 4
- 5TH 5
- 6TH 6
- 7TH 7
- 8TH 8
- 9TH 9
- 10TH
- 11TH

NO. OF POINTS = 10  
BEST FIT = 1

CALCULATED VALUE FOR

A .4333  
B .9758

STAND. ERROR  
OF ESTIMATE = .9847  
COEFFICIENT OF  
DETERMINATION = .9918

CURVE 1  
A = .4333  
B = .9758  
C =

1  
.4333  
1.0250  
1  
.5000  
1.0000  
.9487  
1.0036  
.9518

OPTIONS

- READ
- RESC
- S-L
- D CV
- D PT
- ADD
- ORIG
- NEU
- DISP
- REST
- REVE
- SPEC
- HARD
- CHRN
- PUNC
- END

TO CHANGE A CONSTANT -  
TYPE LETTER THEN VALUE, NEXT  
PICK DONE, DISPLAY, OR ENTER  
-91.005  
-91.0  
-A.5  
-AD.

DONE

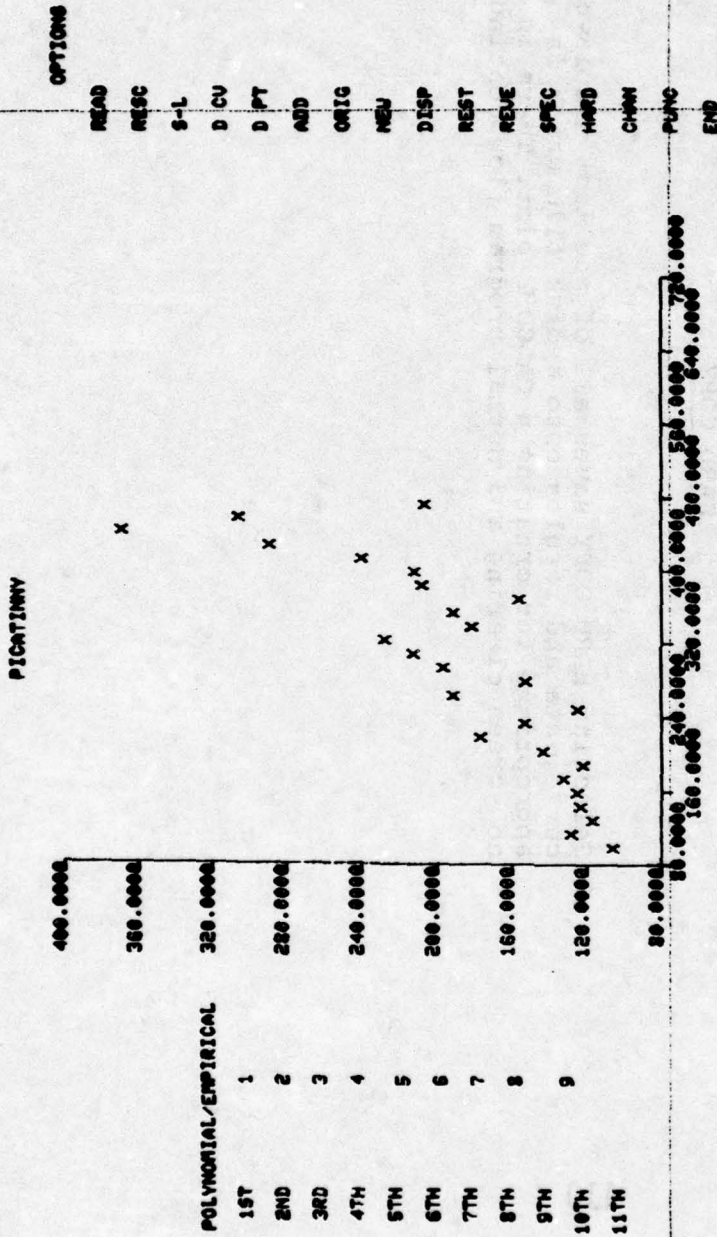
DISPLAY

ENTER

WHICH CURVE WOULD YOU LIKE TO WORK ON

PUNCH DECK

To obtain a punch deck of the current data set, select the phrase PUNCH DECK or PUNCH. All punch decks are queued until the completion of GRAF-TEK at which time they are all punched out. There is no screen change during this process.



NO. OF POINTS = 26  
 BEST FIT =

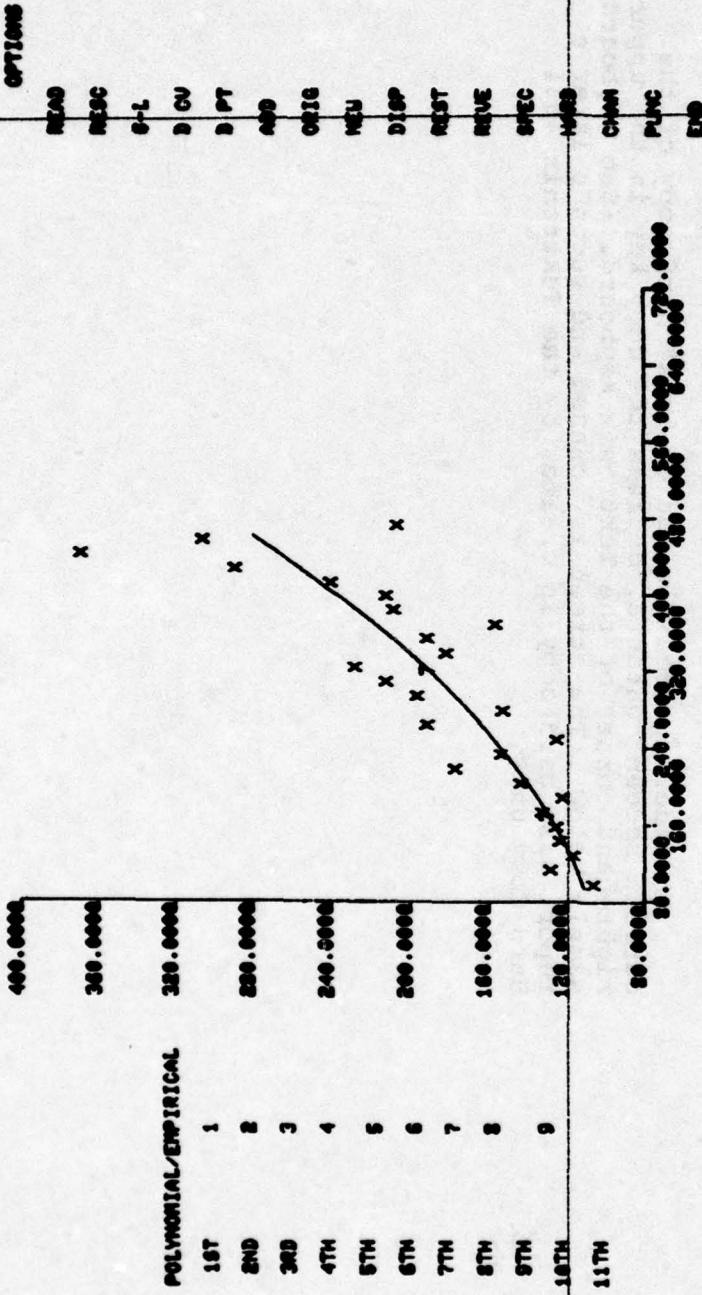
CURVE  
 A .  
 B .  
 C .  
 STAND. ERROR  
 OF ESTIMATE  
 COEFFICIENT OF  
 DETERMINATION

IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE KEYBOARD. FIRST RE-HIT "READ IN NEW DATA". IF NOT HIT "END OF PROGRAM". OR, IF YOU WISH TO REREAD YOUR DATA, SELECT "ORIGINAL POINTS" MESSAGE

HARD COPY

Selecting HARD COPY saves all of the last displayed curve data and results onto a disk file which is appropriate for creating a CALCOMP plot. There is no screen clearing and normal program flow continues.

PICATINIV

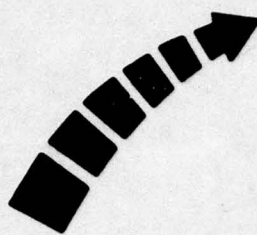


NO. OF POINTS = 26  
BEST FIT = 7

CURVE 7  
A = 101.4954  
B = .0440  
C = .0007  
STAND. ERROR  
OF ESTIMATE = 34.1910  
COEFFICIENT OF  
DETERMINATION = .7062

IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE KEYBOARD. FIRST RE-HIT "READ IN NEW DATA" IF NOT HIT "END OF PROGRAM" OR, IF YOU WISH TO INCREASE YOUR DATA, SELECT "ORIGINAL POINTS" PHRASE

In order to obtain a "quick look" hard copy of the current screen contents, depress the copy key in the upper right-hand corner of the Tektronix keyboard. (See keyboard sample below). The screen is scanned and seconds later a report size hard copy is created by the Tektronix 4631 Hard Copy Unit.



POWER LOCAL/LINE  
 LOCAL/LINE  
 ASCII ALT  
 ON OFF KYBD ON  
 CODE LOCKED CLEAR WRITE  
 EXPANDER LINE  
 3  
 1 OFF 2 FULL RELEASE AUTO PRINT COPY  
 MARGIN CONTROL OFF

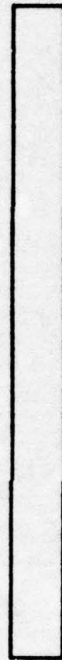


RESET PAGE  
 {  
 ! 1  
 " 2  
 # 3  
 \$ 4  
 % 5  
 & 6  
 ' 7  
 ( 8  
 ) 9  
 \* :  
 = -  
 }  
 BACK SPACE

ESC  
 ~  
 Q  
 W  
 E  
 R  
 T  
 Y  
 U  
 I  
 O  
 P  
 @  
 LF  
 RETURN

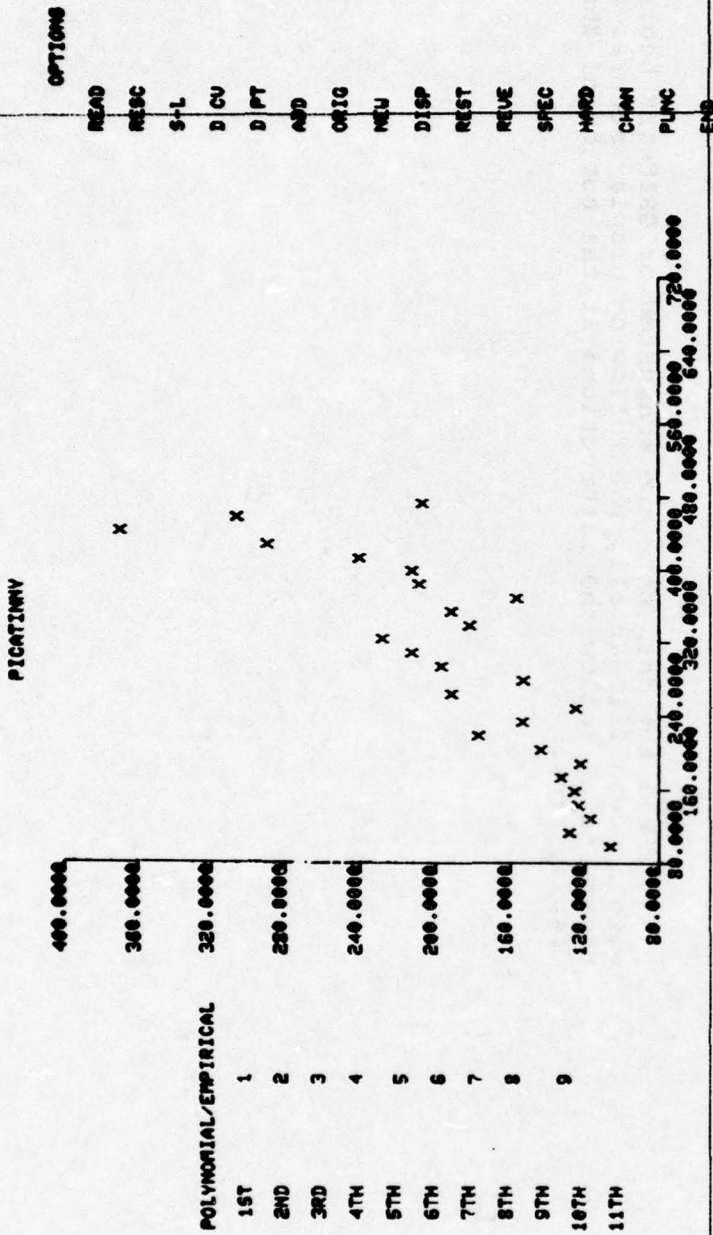
TAB  
 CTRL  
 A  
 S  
 D  
 F  
 G  
 H  
 J  
 K  
 L  
 ; :  
 !  
 RUB OUT

TTY LOCK  
 SHIFT  
 Z  
 X  
 C  
 V  
 B  
 N  
 M  
 < >  
 ? /  
 SHIFT  
 BREAK



END OF PROGRAM

To terminate GRAF-TEK, select the phrase  
END OF PROGRAM or END.



NO. OF POINTS = 26  
 BEST FIT =

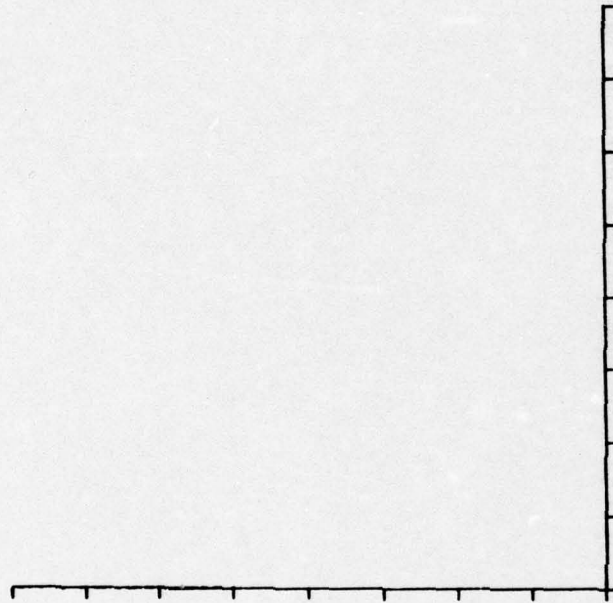
CURVE  
 A .  
 B .  
 C .  
 STAND. ERROR  
 OF ESTIMATE .  
 COEFFICIENT OF  
 DETERMINATION .

IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE KEYBOARD. FIRST RE-HIT "READ IN NEW DATA", IF NOT HIT "END OF PROGRAM". OR, IF YOU WISH TO REREAD YOUR DATA, SELECT "ORIGINAL POINTS" PHRASE

V. CREATING A DATA SET

If all the data sets are exhausted or GRAF-TEK begins with no data file at all, the following display occurs. To create data, follow the instructions at the bottom of the display area.

OPTIONS  
 READ IN NEW DATA  
 RESCALE AXES  
 S-L FORM  
 DELETE ALL CURVES  
 DELETE POINT(S)  
 ADD NEW POINT(S)  
 ORIGINAL POINTS  
 NEW PTS. NOW ORG.  
 DISPLAY A CURVE  
 RESTORE DELETED POINT(S)  
 REVERSE X AND Y  
 SPECIFY CONSTANTS  
 HARD COPY  
 CHANGE TITLE  
 PUNCH DECK  
 END OF PROGRAM



POLYNOMIAL/EMPIRICAL

- 1ST 1  $Y = A+BX$
- 2ND 2  $Y = AX^2$
- 3RD 3  $Y = AE+BX$
- 4TH 4  $Y = \frac{X}{A+BX}$
- 5TH 5  $Y = AX^2+C$
- 6TH 6  $Y = AE+BX+C$
- 7TH 7  $Y = A+BX+CX^2$
- 8TH 8  $Y = \frac{X}{A+BX+C}$
- 9TH 9  $Y = AE+BX+CX^2$
- 10TH E - 2.7182818
- 11TH

NO. OF POINTS -  
 BEST FIT "

CURVE  
 A =  
 B =  
 C =  
 STAND. ERROR  
 OF ESTIMATE =  
 COEFFICIENT OF  
 DETERMINATION =

IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE  
 KEYBOARD. FIRST RE-HIT "READ IN NEW DATA". IF NOT HIT "END OF PROGRAM"  
 OR, IF YOU WISH TO REREAD YOUR DATA, SELECT "ORIGINAL POINTS" PHRASE

To type in via the Tektronix keyboard - just like ADD  
NEW POINT(S), select the phrase READ IN NEW DATA or READ.

OPTIONS

- READ IN NEW DATA
- RESPONSE AXES
- S-L FORM
- DELETE ALL CURVES
- DELETE POINT(S)
- ADD NEW POINT(S)
- ORIGINAL POINTS
- NEW PTS. NOW ORG.
- DISPLAY A CURVE
- RESTORE DELETED POINT(S)
- REVERSE X AND Y
- SPECIFY CONSTANTS
- HARD COPY
- CHANGE TITLE
- PUNCH DECK
- END OF PROGRAM

POLYNOMIAL/EMPIRICAL

- 1ST 1  $Y = A+BX$
- 2ND 2  $Y = AX^2$
- 3RD 3  $Y = A+BX$
- 4TH 4  $Y = A+BX^2$
- 5TH 5  $Y = AX^2+C$
- 6TH 6  $Y = A+BX+C$
- 7TH 7  $Y = A+BX+CX^2$
- 8TH 8  $Y = A+BX^2+C$
- 9TH 9  $Y = A+BX+CX^2$
- 10TH E = 0.7182818
- 11TH

NO. OF POINTS =  
BEST FIT .

CURVE

- A :
- B :
- C :

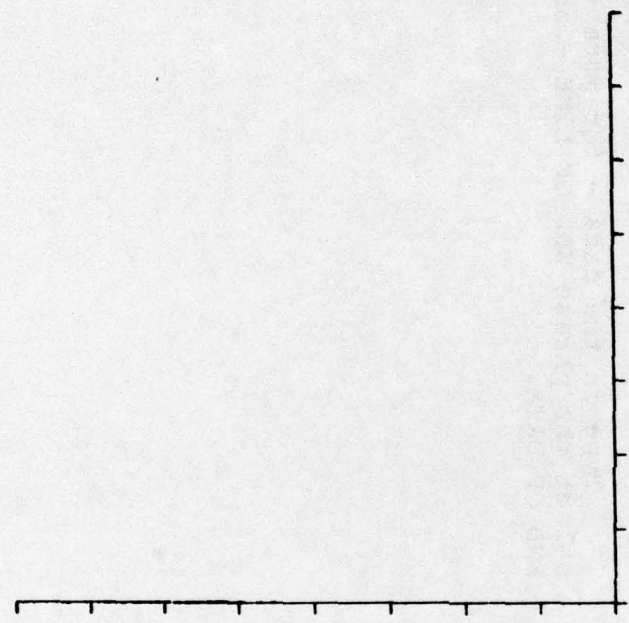
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE KEYBOARD. FIRST RE-HIT READ IN NEW DATA. IF NOT HIT END OF PROGRAM OR, IF YOU WISH TO RE-READ YOUR DATA, SELECT ORIGINAL POINTS. PHRASE

The ADD inputting technique should be used.

OPTIONS

- READ IN NEW DATA
- RESCALE AXES
- S-L FORM
- DELETE ALL CURVES
- DELETE POINT(S)
- ADD NEW POINT(S)
- ORIGINAL POINTS
- NEW PTS. NOW ORG.
- DISPLAY A CURVE
- RESTORE DELETED POINT(S)
- REVERSE X AND Y
- SPECIFY CONSTANTS
- HARD COPY
- CHANGE TITLE
- PUNCH DECK
- END OF PROGRAM



POLYNOMIAL/EMPIRICAL

- 1ST 1  $Y = A+BX$
- 2ND 2  $Y = AX^2$
- 3RD 3  $Y = AE+BX$
- 4TH 4  $Y = A+BX^2$
- 5TH 5  $Y = AX^2+C$
- 6TH 6  $Y = AE+BX+C$
- 7TH 7  $Y = A+BX+CX^2$
- 8TH 8  $Y = A+BX^2+C$
- 9TH 9  $Y = AE+BX+CX^2$
- 10TH E = 2.7182818
- 11TH

NO. OF POINTS =  
BEST FIT

CURVE

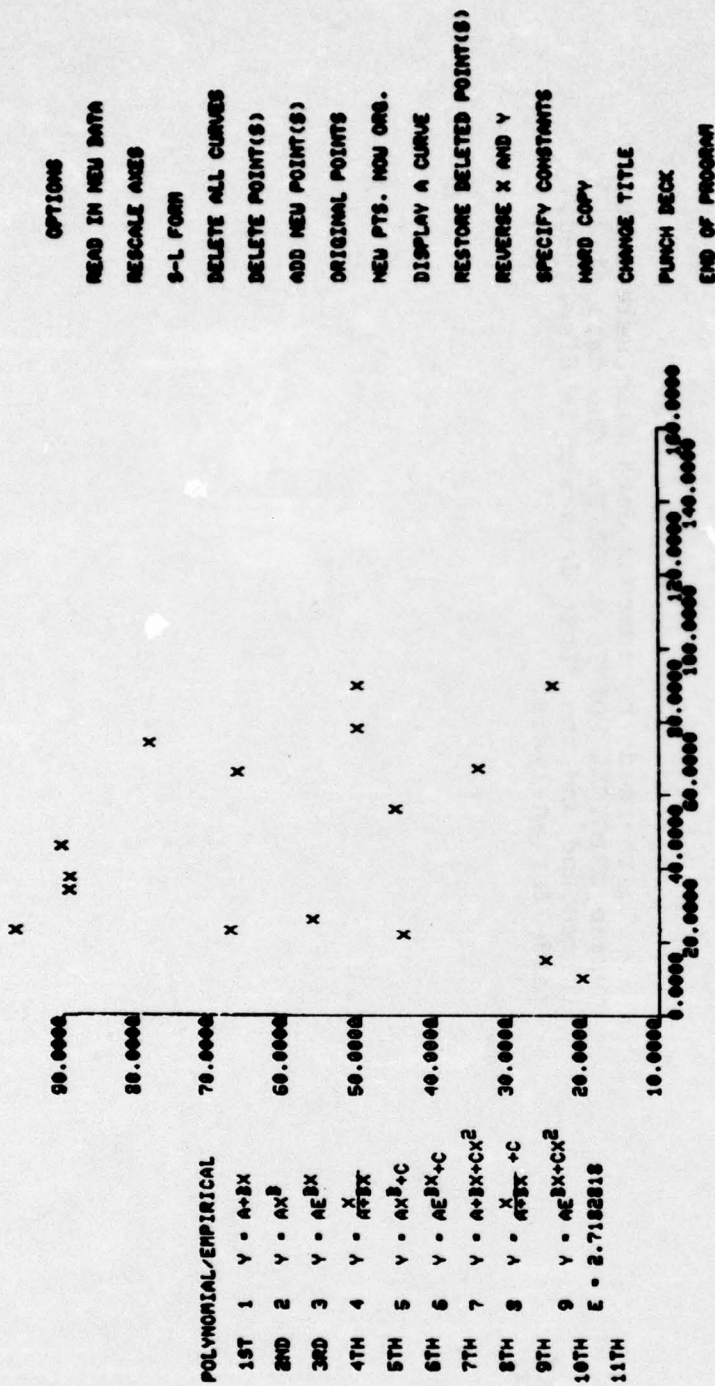
- A .
- B .
- C .

STAND. ERROR  
OF ESTIMATE.  
COEFFICIENT OF  
DETERMINATION.

END OF LINE                      END OF DATA  
PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.

IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE  
KEYBOARD. FIRST RE-HIT "READ IN NEW DATA". IF NOT HIT "END OF PROGRAM".  
OR, IF YOU WISH TO REREAD YOUR DATA, SELECT "ORIGINAL POINTS" CHANGE

Type in the data - for more than one line  
select the phrase END OF LINE - and then select  
END OF DATA.



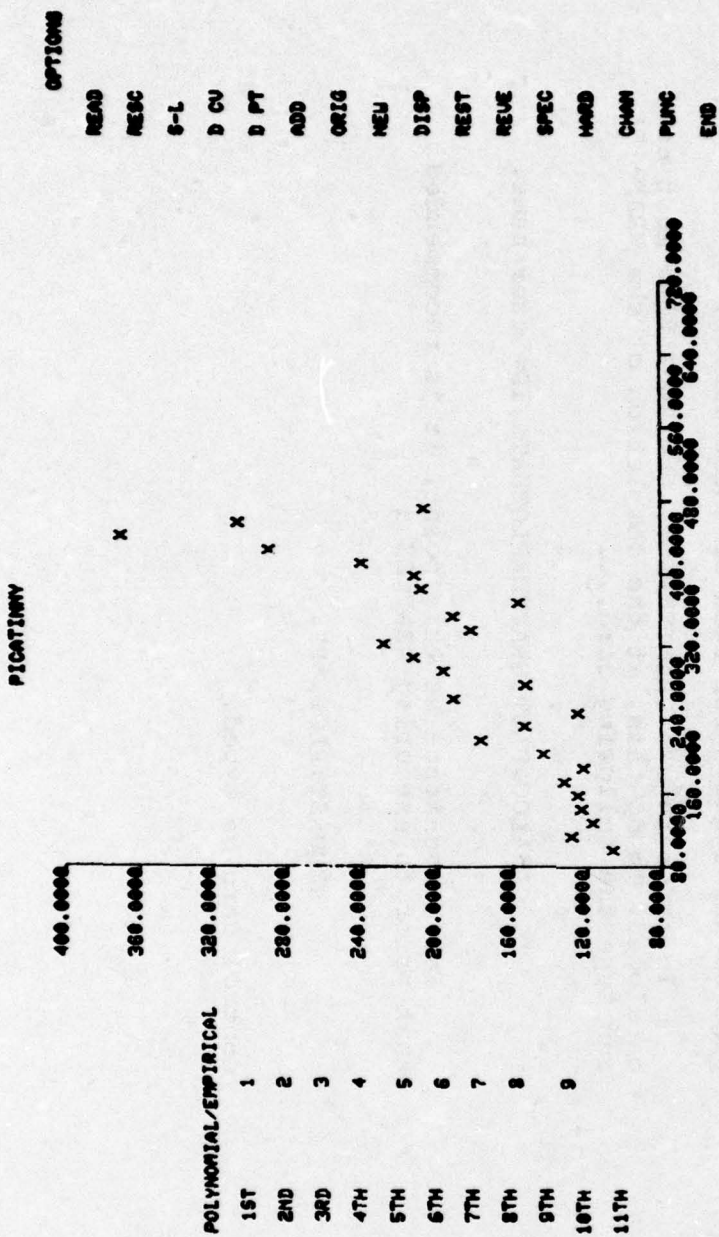
CURVE  
A =  
B =  
C =  
STAND. ERROR  
OF ESTIMATE =  
COEFFICIENT OF  
DETERMINATION =

END OF LINE  
PLEASE TYPE IN X AND Y COORD. IN PAIRS EACH NUMBER FOLLOWED BY A COMMA.  
10,89,15,25,90,50,23,67,78,59,37,5,88,88,88,66,34,89,88,45,67,34,83,87,  
28,44,86,88,74,78,46,59,59,54  
IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE  
KEYBOARD. FIRST RE-HIT "READ IN NEW DATA". IF NOT HIT "END OF PROGRAM"  
OR, IF YOU WISH TO REREAD YOUR DATA, SELECT "ORIGINAL POINTS" PHRASE

OPTIONS

- READ IN NEW DATA
- RESCALE AXES
- S-L FORM
- DELETE ALL CURVES
- DELETE POINT(S)
- ADD NEW POINT(S)
- ORIGINAL POINTS
- NEW PTS. NOW ORG.
- DISPLAY A CURVE
- RESTORE DELETED POINT(S)
- REVERSE X AND Y
- SPECIFY CONSTANTS
- HARD COPY
- CHANGE TITLE
- PUNCH DECK
- END OF PROGRAM

To re-read the current data file select the phrase ORIGINAL POINTS or ORIG. The data file is rewound and the first data set is displayed, ready for analysis.



IF YOU WISH TO RUN A NEW SET OF DATA POINTS, YOU MAY TYPE IT IN VIA THE KEYBOARD. FIRST RE-HIT "READ IN NEW DATA". IF NOT HIT "END OF PROGRAM" OR, IF YOU WISH TO RELOAD YOUR DATA, SELECT "ORIGINAL POINTS" PHASE

## VI. CREATING A CALCOMP PLOT

Every time the user selects the phrase **HARD COPY** the last curve and its statistical results are stored onto a computer disk file called **PLOT**. This file, when used as data for the **GRAFTEK** program produces a **CALCOMP** drum plot having a graph for each of these curves.

In order to use **GRAFTEK**, the **PLOT** file must be cataloged. To do this, at the completion of the **GRAF-TEK** run type the following card....

```
CATALOG,PLOT,GRAFTEKPLOTDATA,ID= user name.
```

For convenience at this point, it is recommended that prior to executing **GRAFTEK** a

```
REQUEST,PLOT,*PF.
```

control card be typed.

When PLOT is successfully cataloged, run the following control cards via BATCH to produce the desired CALCOMP plot.

GRAFPLT,NT1.  
COMMENT.(XXX-YY,NNNNL), user name  
ATTACH,GPLOT,GRAFTEKPLOT,ID=MISDSEAD.  
ATTACH,PLOT,GRAFTEKPLOTDATA,ID= user name.  
REQUEST,TAPE77,NT,S. PLOT/user name  
GPLOT.  
6-7-8-9 Card

END OF GRAF-TEK

STOP  
.802 CP SECONDS EXECUTION TIME  
COMMAND-

GRAFTEK ROUTINE  
UPDATE SUBSCRIPTION SERVICE

If you would like to receive any future revisions of this manual automatically or desire extra copies, please fill out the appropriate form below and return to;

WAYNE D. LUNGER  
MISD/SEAD BLDG. 353S.  
PICATINNY ARSENAL  
DOVER, NJ. 07801

-----  
cut along dotted lines  
-----

Please send me any future revisions to GRAFTEK manual.

NAME: \_\_\_\_\_

ORGANIZATION: \_\_\_\_\_

BUILDING: \_\_\_\_\_

(For subscribers outside Picatinny Arsenal, complete:)

ADDRESS: \_\_\_\_\_

STATE/ZIP CODE: \_\_\_\_\_

-----  
cut along dotted lines  
-----

Please send me \_\_\_\_\_ GRAFTEK Manual(s).

NAME: \_\_\_\_\_

ORGANIZATION: \_\_\_\_\_

BUILDING: \_\_\_\_\_

(For subscribers outside Picatinny Arsenal, complete:)

ADDRESS: \_\_\_\_\_

STATE/ZIP CODE: \_\_\_\_\_  
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER <b>17</b> MISD <del>User Manual</del> -UM-76-3	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) <b>6</b> GRAFTEK - <del>the</del> GRAFFIT curve fitting program implemented at the TEKtronix terminal <b>VERSION.</b>	<b>9</b> TYPE OF REPORT & PERIOD COVERED <b>USER MANUAL (FINAL)</b>	
7. AUTHOR(s) <b>10</b> Wayne D. Lunger	6. PERFORMING ORG. REPORT NUMBER	
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <b>2</b> GRAFTEK is an interactive graphics program that fits by least squares, a curve to N data points. This code combines two CDC 274 graphics curve fitting programs (GRAFFIT, LSQ) for use on the TEKtronix 4014 storage tube using Tektronix software (TCS). The program fits the curve and determines the constants for any of nine empirical equations or a polynomial of up to 11th degree, and displays the fitted curve (up to three at one time) against a background of the data points.		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

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over 407641

*[Handwritten signature]*

20. Abstract (continued)

Options include reading in new data, rescale of axes, deleting all displayed curves, deleting points, adding new points, restoring all original or selected deleted points, specifying constants, and calling for CALCOMP plotter or "quick look" hard copy of output.

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