



50000 / Program Description I

Program Title

POLYNOMIAL REGRESSION

DEGREE 1, 2, 3, 4.

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Program Description, Equations, Variables

FIRST PROGRAM (PR 1234)

For the general equation:

$$y = ax^4 + bx^3 + cx^2 + dx + e$$

the program computes the best values for:

a, b, c, d, e if you want a regression of degree 4;

b, c, d, e if you want a regression of degree 3;

c, d, e if you want a regression of degree 2;

d, e if you want a linear regression.

Operating Limits and Warnings

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This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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Sketch(es)

Sample Problem(s) For the following points:

 $(x/y), (.5/1), (1/2), (1.5/3.5), (2.5/5), (4/5), (5/3), (6/2), (7/3), (8/4.5), (9/6), (10/8)$

find best curve of:

DEGREE 4. $a = -0.009$ DEGREE 1. $d = 0.408$ $b = 0.25$ $e = 1.886$ $c = -2.027$ $d = 7.056$ $e = -2.537$ DEGREE 3. $b = 0.062$ $c = -0.924$ $d = 3.945$ $e = 0.687$ DEGREE 2. $c = 0.06$ $d = -1.194$ Solution(s) $e = 2.814$

For the drawing of the different curves, see figure in annex.

See also second program (DC 1234).

Reference(s) Programs number 50687D and 50688D

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50688

User Instructions PR 1234

$y = ax^4 + bx^3 + cx^2 + dx + e$ PR 1234
 $f \Delta$
 $x_1 \uparrow y_i \Sigma + d, e \quad c, d, e \quad b, c, d, e a, b, c, d, e$

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD SIDE 1 AND SIDE 2.			
2	INPUT DATA	x_i		
		y_i	ENT	
	REPEAT THIS STEP FOR $i = 1, \dots, N$		A	i
3	PRESS KEYS		f A	0
	For drawing curves, see second program (DC 1234)			
4	FOR LINEAR REGRESSION, PRESS KEY		B	- d -
				e
5	FOR QUADRATIC REGRESSION, PRESS KEY		C	- c -
				- d -
				e
6	FOR CUBIC REGRESSION, PRESS KEY		D	- b -
				- c -
				- d -
				- e -
7	FOR REGRESSION OF DEGREE 4, PRESS KEY		E	- a -
				- b -
				- c -
				- d -
				e
	If after step number 3, at any moment, you want to know again the coefficients for any regression, press pertaining key.			
	a, b, c, d, e are stored in the following registers:			
	R_A, R_B, R_C, R_D, R_E			
			RCL A	a
			RCL B	b
			RCL C	c
			RCL D	d
			RCL E	e

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	F LBL A		computes $\sum x^i$ for $i = 1, \dots, 8$. and $\sum x^i y$ for $i = 1, \dots, 4$.		RCL 3		
	STO E				STO C		
	h $x \rightarrow y$				RCL 4		
	ENT			060	STO D		
	ENT				RCL 0		
	ENT				STO : 1		
	f PS				STO : 2		
	STO + 1				STO : 3		
	x				STO : 4		
010	STO + 6				STO : 5		
	STO + 2				6		
	x				h ST I		
	STO + 3				1		
	STO + 7			070	g GSB c		
	x				2		
	f PS		Triangulation of system		g GSB d		
	STO + 1				3		
	f PS				g GSB e		
	STO + 8				4		
020	STO + 4				f GSB 9		
	x				RCL 7		
	STO + 9				STO A		
	f PS				RCL 8		
	STO + 2			080	STO B		
	x				RCL 9		
	STO + 5				STO C		
	STO + 3				RCL 6		
	x				STO : 7		
	STO + 6				STO : 8		
030	x				STO : 9		
	STO + 8				f PS		
	CLX				STO : 0		
	RCL E				f PS		
	f PS			090	1		
	STO + 5				1		
	f PS				h ST I		
	x				7		
	STO + 0				g GSB d		
	x				8		
040	STO + 4				g GSB e		
	x				9		
	STO + 7				f GSB 9		
	x				f PS		
	STO + 9			100	RCL 2		
	f ISZ				STO A		
	h RC I				RCL 3		
	f PS				STO B		
	STO 0				RCL 1		
	f PS				STO : 2		
050	h RTN				STO : 3		
	g LBL a				STO : 4		
	f PS				5		
	RCL 1				h ST I		
	STO A			110	2		
	RCL 2				g GSB e		
	STO B				3		

REGISTERS									
0 $\sum xy$	1 $\sum x^4$	2 $\sum x^5$	3 $\sum x^6$	4 $\sum x^2 y$	5 $\sum x^6$	6 $\sum x^7$	7 $\sum x^3 y$	8 $\sum x^8$	9 $\sum x^4 y$
S0 N	S1 $\sum x$	S2 $\sum x^2$	S3 $\sum x^3$	S4 $\sum x^4$	S5 $\sum y$	S6 $\sum x^2$	S7 $\sum x^3$	S8 $\sum x^4$	S9 $\sum x^5$
A a	B b	C c	D d	E e	I used				

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	f GSB 9	50688			GTO 1		
	RCL 6			170	f LBL D		computes b, c, d, e
	STO A				f GSB 6		
	RCL 5				f LBL 1		
	STO : 6				RCL 7		
	STO : 7				RCL 6		
	8				RCL A		
120	h ST I				f GSB 8		
	6				STO B		
	g GSB e				f - x -		b displayed
	RCL 8				GTO 2		
	STO : 9			180	f LBL C		computes c, d, e
	GTO 6				f GSB 6		
	g LBL c		Subroutines		f LBL 2		
	f GSB 7				RCL 4		
	g LBL d				RCL 3		
	f GSB 7				RCL A		
130	g LBL e				f GSB 8		
	f GSB 7				RCL 2		
	f LBL 9				RCL B		
	f GSB 7				f GSB 8		
	f GSB 7			190	STO C		c displayed
	RCL B				f - x -		
	STO A				GTO 3		
	RCL C				f LBL B		computes d, e
	STO B				f GSB 6		
	RCL D				f LBL 3		
140	STO C				RCL 0		
	h RTN				f PS		
	f LBL 7				RCL 9		
	h $x \neq I$				RCL A		
	RCL (i)			200	f GSB 8		
	RCL A				RCL 8		
	x				RCL B		
	h $x \neq Y$				f GSB 8		
	f ISZ				RCL 7		
	h $x \neq I$				RCL C		
150	h $x \neq y$				f GSB 8		
	STO -(i)				STO D		
	f ISZ				f - x -		d displayed
	h $x \neq y$				RCL 5		
	h RTN			210	RCL 4		
	f LBL 6				RCL A		
	0				f GSB 8		
	STO A				RCL 3		
	STO B				RCL B		
	STO C				f GSB 8		
160	h RTN				RCL 2		
	f LBL 8				RCL C		
	x				f GSB 8		
	-				RCL 1		
	h RTN			220	RCL D		
	f LBL E		computes a, b, c, d, e		f GSB 8		
	RCL 9				f PS		
	STO A				STO E		e displayed
	f - x -		a displayed		h RTN		

LABELS					FLAGS	SET STATUS			
A	+	B degree 1	C degree 2	D degree 3	E degree 4	0	FLAGS	TRIG	DISP
triangle function	b	c used	d used	e used	1	0	ON OFF 0 ☐ ☒	DEG ☒	FIX ☒
	1 used	2 used	3 used	4	2	1 ☐ ☒	GRAD ☐	SCI ☐	
	6 used	7 used	8 used	9 used	3	2 ☐ ☒	RAD ☐	ENG ☐	
						3 ☐ ☒		n <u>2</u>	

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DC 1234

2

 $\frac{dy}{dx}$

X

 $\hat{y}$

d, e

c, d, e

b, c, d,

e a. b.

c, d, e

[illegible]

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	f LBL A		computes $\hat{y}$		RCL 0		
	STO 1				f PS		
	$g x^2$				RCL 9		
	$g x^2$			060	RCL A		
	RCL A				f GSB 8		
	x				RCL 8		
	RCL 1				RCL B		
	$g x^2$				f GSB 8		
	RCL 1				RCL 7		
010	x				RCL C		
	RCL B				f GSB 8		
	x				STO D		
	+				f - x -		
	RCL 1			070	RCL 5		
	$g x^2$				RCL 4		
	RCL C		See program 1 (PR 1234)		RCL A		Subroutines
	x				f GSB 8		
	+				RCL 3		
	RCL 1				RCL B		
020	RCL D				f GSB 8		
	x				RCL 2		
	+				RCL C		
	RCL E				f GSB 8		
	+			080	RCL 1		
	h RTN				RCL D		
	f LBL E				f GSB 8		
	RCL 9				f PS		
	STO A				STO E		
	f - x -				h RTN		
030	GTO 1				f LBL 6		
	f LBL D				0		
	f GSB 6				STO A		
	f LBL 1				STO B		
	RCL 7			090	STO C		
	RCL 6				h RTN		
	RCL A				f LBL 8		
	f GSB 8				x		
	STO B				-		
	f - x -				h RTN		
040	GTO 2						
	f LBL C						
	f GSB 6						
	f LBL 2						
	RCL 4			100			
	RCL 3						
	RCL A						
	f GSB 8						
	RCL 2						
	RCL B						
050	f GSB 8						
	STO C						
	f - x -						
	GTO 3						
	f LBL B			110			
	f GSB 6						
	f LBL 3						

REGISTERS

0 used	1 x	2 used	3 used	4 used	5	6 used	7 used	8	9 used
S0	S1 used	S2 used	S3 used	S4 used	S5 used	S6	S7 used	S8 used	S9 used
A a	B b	C c	D d	E e	I				

ANNEX



