

00556C PROGRAM DESCRIPTION I

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Program Title POLYNOMIAL REGRESSION

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State/Country _____

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Program Description, Equations, Variables

This program deals with polynomial regression and makes use of the Math 1 module. If it is desired to fit through m pairs of (x, y) points a polynomial of degree n ($n \leq 7$ is the practical accuracy limitation. The user can set $n > 7$ at his own risk and memory capacity). The program accumulates the summations of power ($x, x^2, x^3, \dots$ etc) in the proper registers which the math module uses to solve for the coefficients $a_0, a_1, a_2, \dots, a_n$ in

$$y = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \dots + a_n x^n$$

Projections are possible once the above coeff. are calculated.

Necessary Accessories CARD READER, MATH I MODULE, MEMORY MODULES

Operating Limits and Warnings number of points $(x, y) \geq n + 1$.

Reference(s) _____

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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00556C PROGRAM DESCRIPTION II

Sample Problem (Sketch if Desired)

Sample Problem (Sketch if Desired)

Find the coefficients of the 4th order polynomial that fits the (x, y) data. Then calculate $\hat{y}(3.5)$.

<u>y</u>	<u>x</u>
8.1	2
6.0	1
9.0	2.5
15.0	3.0
20.0	4.0

SOLUTION:

Input		ay	Comments
	XEQ "ZF"		
N?	4.00000 RUN		
Y↑X?	8.10000 ENTER↑ 2.00000 RUN		
Y↑X?	6.00000 ENTER↑ 1.00000 RUN		
Y↑X?	9.00000 ENTER↑ 2.50000 RUN		
Y↑X?	15.00000 ENTER↑ 3.00000 RUN		
Y↑X?	20.00000 ENTER↑ 4.00000 RUN		
Y↑X?	RUN		
	X1.=-85.77266 X2.=193.39119 X3.=-138.44086 X4.=41.03769 X5.=-4.21543		
	XEQ "PP"		
X?	3.50000 RUN		
	Y=22.10066		

USER INSTRUCTIONS

SIZE: YOUR CHOICE (HP-41C)				
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1	Load program.			
2	Check that your "size" is enough.			
3	Initialize		XEQ ^T ΣP	N?
4	Enter polynomial order	n	R/S	Y↑X?
5	Input your data (x _i , y _i) i = 1, 2, ..., m (m ≥ n+1) When completed simply press RUN, and go to step 7.	y _i x _i	ENTER↑ R/S	Y↑X?
6	(Optional) to delete a data set (while Y↑X? is still being prompted).	y _k x _k	SF 01 ENTER↑ R/S	Y↑X?
7	The coeff. a ₀ , a ₁ , ..., a _n will be displayed as X1., X2., ... etc. * Omit if printer is ON, or flag 21 is cleared.		R/S* R/S* R/S*	X1. = (a ₀) X2. = (a ₁) : : X _{n+1} = (a _n)
8	(Optional) For projections of x on y.	x	XEQ ^T PP R/S	x? Y = (ŷ)
9	(Optional) To locate solution vector. (Use with printer).		XEQ A R/S	1 st . last reg print regs

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STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
01	LBL "ΣP"			49	INT		
02	SF 21			50	+		CALC.
03	CF 04			51	2		ΣX ^r
04	CF 03			52	-		
05	CLRG			53	RCL 02		
06	"N?"			54	X<>Y		
07	PROMPT		PROMPT	55	Y↑X		IF FLAG 1 IS
08	1		FORN	56	FC? 01		SET, Σ-
09	+			57	ST+ IND		
10	STO 14			12			
11	1 E3			58	FS? 01		
12	/			59	ST- IND		
13	STO 13		LBL00:	12			
14	LBL 00		DATA INPUT	60	ISG 12		
15	CF 01		LOOP	61	DEG		
16	CF 22			62	ISG 11		
17	BEEP			63	GTO 02		
18	"Y↑X?"		IF NO KEYED	64	RCL 01		
19	PROMPT		DIGIT, START	65	RCL 02		
20	FC? 22		SOLVING.	66	RCL 10		
21	GTO 03			67	DSE X		
22	STO 02			68	STO X		
23	X<>Y			69	Y↑X		CALC.
24	STO 01			70	*		ΣYX ^y
25	RCL 13		RESET	71	RCL 14		
26	FRC		COUNTERS	72	X↑2		
27	STO 13			73	LASTX		
28	STO 11			74	+		
29	ISG 13			75	15		
30	15			76	+		
31	STO 12			77	RCL 10		
32	RCL 15			78	1		
33	1			79	-		
34	+			80	+		
35	CF 21		VIEW # OF	81	X<>Y		IF FLAG 1 IS
36	VIEW X		DATA	82	FC? 01		SET, Σ-
37	SF 21			83	ST+ IND		
38	LBL 04		LBL04: OUTER	Y			
39	RCL 11		LOOP FOR Σ	84	FS? 01		
40	FRC			85	ST- IND		
41	STO 11			Y			
42	ISG 11			86	ISG 13		
43	RCL 13			87	GTO 04		
44	INT		LBL 2: INNER	88	GTO 00		
45	STO 10		LOOP FOR Σ	89	LBL 03		PREPARE
46	LBL 02			90	SF 21		FLAGS TO
47	RCL 10			91	SF 04		GO TO "PVT"
48	RCL 11			92	SF 05		

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STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
93	CF 10			140	RCL IND		RECALL Q_n
94	CF 09			13			
95	CF 08			141	*		
96	CF 07			142	DSE 13		
97	CF 06			143	LBL 07		
98	XROM "PV			144	RCL IND		
T"				13			
99	RTN			145	+		LOOP TO CALC. $\hat{Y}$.
100	LBL A		ROUTINE	146	*		
101	RCL 14		TO LOCATE	147	DSE 13		
102	X↑2		SOLUTION	148	GTO 07		
103	LASTX		VECTOR	149	RCL IND		RECALL Q_0
104	+			13			
105	15			150	+		
106	+			151	"Y="		
107	STO Y			152	ARCL X		
108	1			153	AVIEW		
109	-			154	END		
110	RCL 14						
111	+						
112	1 E3						
113	/						
114	+						
115	STOP						
116	PRREGX						
117	RTN						
118	LBL "PP"		→ $\hat{Y}$ ROUTINE				
119	RCL 14						
120	X↑2			80			
121	LASTX						
122	ST+ X						
123	+						
124	14						
125	+						
126	STO Y						
127	RCL 14						
128	-						
129	1			90			
130	+						
131	1 E3						
132	/						
133	+						
134	STO 13						
135	"X?"						
136	PROMPT		FILL STACK				
137	ENTER↑		WITH X				
138	ENTER↑						
139	ENTER↑			00			

[illegible]

PROGRAM REGISTERS NEEDED: 34

ROW 1 (1 : 5)



ROW 2 (6 : 14)



ROW 3 (15 : 20)



ROW 4 (21 : 30)



ROW 5 (31 : 40)



ROW 6 (41 : 52)



ROW 7 (53 : 60)



ROW 8 (61 : 69)



ROW 9 (70 : 81)



ROW 10 (82 : 88)



ROW 11 (89 : 95)



ROW 12 (96 : 103)



ROW 13 (104 : 112)



ROW 14 (113 : 119)



ROW 15 (120 : 129)



ROW 16 (130 : 138)



ROW 17 (139 : 147)



ROW 18 (148 : 154)



ROW 19 (154 : 154)

