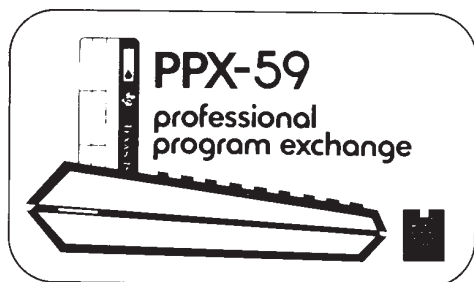




## Submission Abstract

## IMPORTANT

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# TEXAS INSTRUMENTS Calculator Products Division

## Program Description

Program Title:

FUNCTION AND DERIVATIVES

Rev.

Method, Equations, Sketches, Limitations, References, Error Recovery:

This program allows input of any desired function with subsequent evaluation of the function and its first two derivatives at any value of the independent variable. The function is user defined in the LRN mode. The derivatives are calculated from:

$$\frac{df}{dx}(x) = \frac{F(X(1+\delta)) - F(X(1-\delta))}{2 \times \delta}$$

$$\text{and } \frac{d^2F}{dx^2}(x) = \frac{F(X(1+2\delta)) - 2(F(X) + F(X(1-2\delta)))}{4\delta^2}$$

where:  $F(X)$  = user defined function

$\delta$  = incremental step =  $\Delta \approx .01$

Note:  $x = 0$  not allowed



User Instructions

Program Title	
FUNCTION AND DERIVATIVES	
$\Delta$	$F(x)$
$x$	$df/dx$
$d^2f/dx^2$	

Partition (OP 17) Parentheses Levels  
479 59\* 3 t Register ☐

Angular Mode SBR Levels  
(if applicable) Absolute Addresses ☐

Library Module ID \*239.29 Disturbs Pending Operations  
for TI-58 ☒

LABELS (Op 08)	
[INV] [1/x] [CE] [CLR] [x <sup>2</sup> ]	[x <sup>2</sup> ] [x <sup>2</sup> ]
[F] [1/x] [STO] [RCL] [SUM]	[y <sup>*</sup> ] [y <sup>*</sup> ]
[EE] [1/x] [1/x] [1/x]	[GTO] [X]
[SBR] [1/x] [1/x] [1/x]	[R/S] [1/x]
[+/-] [1/x] [1/x] [1/x]	[INV] [1/x]
[1/x] [1/x] [1/x] [1/x]	[SUM] [1/x]
[1/x] [1/x] [1/x] [1/x]	[F1] [1/x]
[1/x] [1/x] [1/x] [1/x]	[Up] [1/x]
[1/x] [1/x] [1/x] [1/x]	[Gnd] [1/x]
[1/x] [1/x] [1/x] [1/x]	[Cos] [1/x]
[1/x] [1/x] [1/x] [1/x]	[Sin] [1/x]
[1/x] [1/x] [1/x] [1/x]	[Tan] [1/x]
[1/x] [1/x] [1/x] [1/x]	[1/x] [1/x]

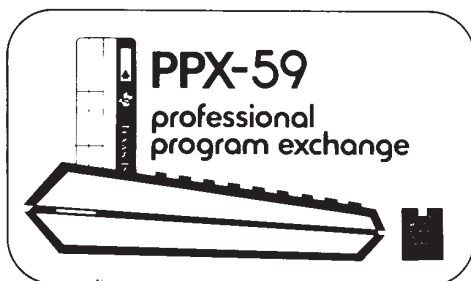
USER DEFINED KEYS	
A	Increment $\Delta \sim .01$
B	X
C	$df/dx$ at X
D	$d^2f/dx^2$ at X
E	
A	RCL S
B	RCL X
C	F(x)
D	
E	

FLAGS	0	1	2	3	4	5	6	7	8	9
-------	---	---	---	---	---	---	---	---	---	---

STEP	PROCEDURE	ENTER	PRESS	OUTPUT/MODE (see legend below)
1	Enter Program			
2	Initialize			
3	Enter function assuming x as input, (note: Cannot use=), end with rtn.			
4	Return to calculate mode			
5	Enter $\Delta$	$\Delta$	GTO E	
6	Enter X	X	LRN	
7	Evaluate F(x)		LRN	
8	Evaluate $df/dx$ at x		A	$\Delta^*$
9	Evaluate $d^2f/dx^2$ at x		B	$X^*$
			C'	F(x)
			C	$df/dx (x)^*$
			D	$d^2f/dx^2 (x)^*$

DATA REGISTERS (INV)	
0	$\Delta$
1	X
2	
3	
4	
5	
6	
7	
8	
9	
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

Modes: n\* - Printed only (n) -- Displayed Briefly (Pause)  
(n)\* - Printed and displayed



# TEXAS INSTRUMENTS Calculator Products Division

## Sample Problem

Statement of Example

$$\text{let } F(x) = x + e^{-x^2}$$

evaluate  $F(x)$ ,  $\frac{df}{dx}$ ,  $\frac{d^2f}{dx^2}$  at  $x = .01$  and  $1$ . with  $\Delta = .01$

□ See Continuation Sheet

ENTER	PRESS	OUTPUT/MODE (see legend below)		COMMENT
	GTO E			
	LRN	137	00	Input
	(CE +	140	00	Desired
	X <sup>2</sup> +/-Inv	143	00	Function
	Inx ) rtn	146	00	F(x)
	LRN		0	
0.01	A	0.01*	(Δ)*	enter Δ
0.01	B	0.01*	(x)*	enter x = 0.01
	C'	1.009900005		F(x) at .01
	C	0.980002*	(D1)*	df/dx at .01
	D	-1.9994*	(D2)*	d <sup>2</sup> f/dx <sup>2</sup> at .01
1	B	1.*	(x)*	enter x = 1
	C'	1.367879441		F(x) at 1
	C	.2642656432*	(D1)*	df/dx at 1
	D	0.73551366*	(D2)*	d <sup>2</sup> F/dx <sup>2</sup> at 1

Modes: n\* — Printed only    in) — Displayed Briefly (Pause)  
ini\* — Printed and displayed

□ Over