3,9 8,0,0,6
For TI use only

PPX-59
professional
program exchange

TEXAS INSTRUMENTS
Calculator Products Division

Submission Abstract

Program Title	Rev.
FUNCTION AND DERIVATIVES	

Abstract of Program

This program allows input of any desired function and evaluation of the function and its first two derivatives at any desired value of X.

Original SR-52 Program by Richard M. Williams of Corvallis, Oregon.

User Benefits:

Allows quick evaluation of complex functions, whose derivatives may be even more complex.

Category Number 39	Required Progs.	Prog. Steps 137	PC-100A Needed ☐ Library Module ID ☐

Submittal Agreement

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Submission Checklist

- ☒ Recorded Magnetic Cards
- ☒ Submission Abstract
- ☒ Program Description
- ☒ User Instructions
- ☒ Sample Problem
- ☒ Listing
- ☐ _____
- ☐ _____

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:

$$\frac{df}{dx}(x) = \frac{F(X(1+\delta)) - F(X(1-\delta))}{2 \times 5}$$

and

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

where: F(X) = user defined function

δ = incremental step = $\Delta \simeq .01$

Note: x = 0 not allowed

☐ See Continuation Sheet

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User Instructions

Program Title
FUNCTION AND DERIVATIVES

		F(x)		
Δ	x	df/dx	d^2f/dx^2	

Partition (OP 17): 479, 59*
Parentheses Levels: 3
t Register ☐
Angular Mode (if applicable):
SBR Levels:
Absolute Addresses ☐
Library Module ID: *239.29 for TI-58
Disturbs Pending Operations ☒

LABELS (Op 08)

INV	ln x	CE	CLR	x:t	x^2
$\sqrt{x}$	1/x	STO	RCL	SUM	y^x
EE	(	)	÷	GTO	x
SBR	−	RST	+	R/S	.
+/−	=	CLR	INV	log	CP
tan	Pgm	P→R	sin	cos	CMs
Exc	Prd	|x|	Eng	Fix	Int
Deg	Pause	x≠t	Nop	Op	Rad
Lbl	x≠t	Σ+	x̄	Grad	St flg
If flg	D MS	π	List	Write	Dsz
Adv	Prt				

USER DEFINED KEYS

A Increment Δ≈.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		GTO E		
3	Enter function assuming x as input, (note: Cannot use=), end with rtn.		LRN		
4	Return to calculate mode		LRN		
5	Enter Δ	Δ	A	Δ*	(Δ)*
6	Enter X	X	B	X*	(X)*
7	Evaluate F(x)		C'	F(x)	
8	Evaluate df/dx at x		C	df/dx (x)*	(D1)*
9	Evaluate d^2f/dx^2 at x		D	d^2f/dx^2(x)*	(D2)*

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

DATA REGISTERS (INV List)

0 Δ
1 X
2
3
4
5
6
7
8
9
0
1
2
3
4
5
6
7
8
9

☐ See Continuation Sheet

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Sample Problem

Statement of Example

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

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

☐ See Continuation Sheet

ENTER	PRESS	OUTPUT/MODE (see legend below)	COMMENT
	GTO E		
	LRN	137 00	Input
	(CE +	140 00	Desired
	X^2 +/-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^2f/dx^2 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^2F/dx^2 at 1

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

☐ Over