TITLE Differential equation
TITEL
TITRE

PROGRAMMER georger 420
PROGRAMMIERER
PROGRAMMEUR

DATE 9.1.1981
DATUM
DATE

TI PROGRAMMABLE 57

PROGRAM
RECORDPROGRAMM-
BERICHTFICHE PROGRAMME

PROGRAM DESCRIPTION – PROGRAMM BECHREIBUNG – DESCRIPTION DU PROGRAMME

This program is determined for numerical solution of differential equation $y' = f(x, y)$ with use of Runge-Kutta method of second-order, for initial value x_0 and y_0. Here are formulas for iterations:

$$y_{n+1} = y_n + h \cdot f\left[x_n + \frac{h}{2}; y_n + \frac{h}{2} \cdot f\left(x_n, y_n\right)\right]$$

$$x_{n+1} = x_n + h$$

„h“ is a step, $h>0$. The smaller the number h, the more accurate the results, but also the more iteration.

This program was published in czech technical magazine „Sdělovací technika“ at January 1982 issue.

USER INSTRUCTIONS – BENUTZER INSTRUCTIONEN – MODE D´ EMPLOI

STEP SCHRITT SEQ	PRESS BEFEHL APPUYER SUR	DISPLAY ANZEIGE AFFICHAGE
1	From addr 27 insert subroutine for calculation values of	
	function $f(x, y)$. x values are called from R3, y from R4.	
	The last instruction must be IBV SBR	
2	2nd INV C.t, x_0 STO 0, y_0 STO 1, h STO 2, RST	
3	R/S	$\rightarrow y_1$
	RCL 0	$\rightarrow x_1$
4	R/S	$\rightarrow y_2$
	RCL 0	$\rightarrow x_2$
5	Etc.	

FLOW CHARTS / NOTES
FLUSSDIAGRAMM / BEMERKUNGEN
ORGANIGRAMME / NOTES

Blue part of program code is example for equation:

$y' = y + e^x$

$x_0 = 0$
$y_0 = 0$
$h = 0.5$

KEY TASTE TOUCHE	LOC ADR ADR	CODE KODE CODE	COMMENTS BEMERKUNGEN COMENTAIRES
RCL 0	00	33 0	
STO 3	01	32 3	
RCL 1	02	33 1	
STO 4	03	32 4	
SBR 0	04	61 0	
x	05	55	
RCL 2	06	33 2	
:	07	45	
2	08	2	
=	09	85	
SUM 4	10	34 4	
RCL 2	11	33 2	
:	12	45	
2	13	2	
=	14	85	
SUM 3	15	34 3	
SBR 0	16	61 0	
x	17	55	
RCL 2	18	33 2	
=	19	85	
SUM 1	20	34 1	
RCL 2	21	33 2	
SUM 0	22	34 0	
RCL 1	23	33 1	
R/S	24	81	
RST	25	71	
2nd LBL 0	26	86 0	
RCL 3	27	33 3	
INV lnx	28	- 13	
+	29	75	
RCL 4	30	33 4	
=	31	85	
INV SBR	32	- 61	
	33		
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	49		

DATA REGISTERS
DATENSPEICHER
REGISTRES-MEMOIRE

0	Dsz	x_n	
1		y_n	
2		h	
3		x	
4		y	
5	(AOS)		
6	(AOS)		
7	(t)		

LABELS
LABELS
LABELS

0	SBR $f(x,y)$
1	
2	
3	
4	
5	
6	
7	
8	
9	

TEXAS INSTRUMENTS