JZsp01

PROGRAM : IEULER2

AUTHOR : Jan Zijlstra, MTSU.

PURPOSE : To draw an approximate trajectory in the (phase-) *xy*-plane for the autonomous system $x' = f(x,y)$, $y' = g(x,y)$. The method used is the *Improved Euler algorithm*:

$$\begin{cases} x_{i+1} = x_i + \dfrac{f(x_i,y_i)+f(u_i,v_i)}{2}h \\ y_{i+1} = y_i + \dfrac{g(x_i,y_i)+g(u_i,v_i)}{2}h \end{cases} \quad \text{where} \quad \begin{array}{l} u_i = x_i + f(x_i,y_i)h \\ v_i = y_i + g(x_i,y_i)h \end{array}$$

PLATFORM: Texas Instruments TI 82/83 graphing calculator

Input : The user is prompted for the starting values t_0, x_0, and y_0 and stepsize h
The functions $f(t,x,y)$ and $g(t,x,y)$ are specified in Y_2 and Y_3 resp.

Output: a graph of the *xy*-plane showing the approximate trajectory starting at t_0, x_0, and y_0.
Note: to halt the program, press the OFF key.

PROGRAM IEULER2	COMMAND LOCATION
:FnOff	
:Prompt X	Prompt: PRG I/O 2
:Prompt Y	
:Prompt H	
:Lbl P	
:X A	
:Y B	
:T C	
:Y_2 U	
:Y_3 V	
:X+HU X	
:Y+HV Y	
:A+H(U+Y_2)/2 X	
:B+H(V+Y_3)/2 Y	
:Line(A,B,X,Y)	Line: DRAW 2
:Goto P	