DIFFERENTIAL EQUATION of 2nd ORDER - NUMERICAL RESULTS by THE METHOD of RUNGE-KUTTA v1.02

The program finds for a differential equation (d. e. ) of 2nd order given as y’’=f(x,y,y’) the numerical approximation by the method of RUNGA-KUTTA 4th order and provides a plot of the result.

Necessary inputs are the function itself, the interval x1<=x<=x2 to be scrutinized, the increment of steps h and the initial conditions x0, y0(x0), y’0(x0). To enter terms including y’ use the letter D

( mnemonic: y’ = *d* y/dx , cf. example ).

Start RUKUTTA2, then follow the prompts to make your input (see example).

*EXAMPLE:*

Find the numerical approximations of y’’ = -2\*y\*y’ +2\*x within 0.5 <= x <= 4 , initial conditions: y(0.5) = 2.5 , y’(0.5) = 6. Assume h = 0.1 as increment .

Start RUKUTTA2, then enter on the prompts:

Analyze

1: New system enter

y’’(x,y,y’): -2YD +2X enter

Initial x0: .5 enter

Initial y0: 2.5 enter

Initial y’0: 6 enter

Intervall x1<=x<=x2

x1 : .5 enter

x2 : 4 enter

Increment h: .1 enter

After the calculation is finished the screen displays:

L1  L2 L3 = [x y y’]

Press [stat], then 1:Edit

Following these command opens the list-screen to see the numerical results :

*L1 L2 L3*

0.5 2.5 6

* 1. 2.969399408 3.54368148

0.7 3.239299168 1.99869517

…..

1 3.53818401 0.483421356

…..

Scroll down:

3 4.511332317 0.650055211

…..

4 5.219577966 0.758180367

Now press the graph-key to get plots of y ( BLUE ) and y’ ( MAGENTA ):

To change initial conditions and/or the interval of analysis for the same d. e. restart the program and select: 2: Last system .

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