

The EULER Program (TI-89)

To use this program:

- Entering the question: Make sure that your differential equation is in the form $dy/dx = f(x,y)$.
 - Type the equation $f(x,y)$ in " $y_1=$ " (keep your x as x and your y as y).
 - Go to your home screen and run the program.
 - (x_0, y_0) is your initial condition. When it asks " $x_0, y_0=?$ ", type your initial x value and hit enter, then type your initial y value and hit enter.
 - h is the step size
 - n is the number of steps you want the program to calculate at a time.
- Extra Functionality:
 - "continue?" this is asking whether you want the next y value using the same initial conditions and step size you already entered. (1 = yes, 0 = no)
 - "new h and n ?" this is asking whether you want to change your step size. Note: this change will take place at your current x value. It does not restart the entire problem. (1 = yes, 0 = no)
- Example: $dy/dx = x+y$, $y(0) = 1$. You want $h = 0.1$ and the x -values from 0 to 1.
 - Type $y_1="x+y"$, $x_0=0$, $y_0=1$, $h=0.1$, and $n=1$, then the program would give back $y(0.1)$. Enter "1" when it asks if you want to continue. Then the program gives you back $y(0.2)$. If you wanted $y(1)$ without all the intermediate steps at the beginning instead of typing $n=1$, type $n=10$, and the program will display $y(1)$.

To enter this program, get out of your Home screen and go to your menu. Go to program editor and choose option 3 : New. Name your program. You can find all the program functions in the menus at the top of the screen so you don't have to type all the words.

Note : after you run your program, you will need to clear your variables. In your Home directory go to F6 and choose option 1 : clear a-z.

```
:euler()
:Prgm
:ClrHome
:Disp " "
:Disp "x0,y0 = "
:Input x
:Input y
:Local q
:Define q=1
:While q=1
:Prompt h,n
:While q=1
:For j,1,n,1
:u→x
:v→y
:y+h*y1(x)→v
:u+h→u
:EndFor
:ClrHome
:Disp " "
:Disp "x ="
:Disp u
:Disp "y ="
:Disp v
:Disp " "
:Input "continue ?", q
:EndWhile
:Input "new h and n ?", q
:EndWhile
:Disp "done"
:EndPrgm
```