

Euler's Method with the TI-84

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Euler's Method can be done in one line with the TI-84!

We show the method by solving the November 2019 Calculus Option question 4a:

Consider the differential equation $\frac{dy}{dx} = \frac{4x^2 + y^2 - xy}{x^2}$, with $y = 2$ when $x = 1$.

Use Euler's method, with step length $h = 0.1$,

to find an approximate value of y when $x = 1.4$.

First, initialize the variables.

```
1→X:2→Y: .1→H
                                0.1
```

The \rightarrow stands for the "STO" button.

For "X" use the normal X button. For "Y" and "H" use the "alpha" button.

The colon allows multiple commands on one line.

(Only the output of the last command is displayed.)

Now type in Euler's formula:

$$y_{n+1} = y_n + h \times f(x_n, y_n); x_{n+1} = x_n + h$$

```
Y+H* $\frac{4X^2+Y^2-X*Y}{X^2}$ →Y:X+H→X:{X,Y}
```

{X,Y} displays both x and y on one line.

Press ENTER to get the first step

```
{1.1 2.6}
```

Now the great thing. Just press ENTER three more times to get the answer.

```
Y+H* $\frac{4X^2+Y^2-X*Y}{X^2}$ →Y:X+H→X:{X,Y}
```

```
.....{1.2 3.32231405}.....
```

```
Y+H* $\frac{4X^2+Y^2-X*Y}{X^2}$ →Y:X+H→X:{X,Y}
```

```
.....{1.3 4.211966396}.....
```

```
Y+H* $\frac{4X^2+Y^2-X*Y}{X^2}$ →Y:X+H→X:{X,Y}
```

```
.....{1.4 5.33771223}.....
```

So $y(1.4) \approx 5.34$.

Done!