Euler's Method

Description

Euler's Method is a process for finding an approximate numerical solution to the differential function $y' = F(x,y)$ at a desired value of x.

The process requires we start at a known value for the function, (x_0, y_0), close to our target x.

We are going to interate from our known x_0 to our target x in steps of some increment h.

The Method...

As a Sequence (Use This)

- The successive approximations can be expressed as a pair of recursive sequences, as follows:
  - $y_{n+1} = y_n + hF(x_n, y_n)$
  - $x_{n+1} = x_n + h$

  Note that $F(x_n, y_n)$ is the differential function evaluated at (x_n, y_n); thus it is the value of the slope y'.
- You repeatedly evaluate these sequences until x_n equals your target x value.

As a loop (Same as above, but a bit clunkier)

1. Find the value of derivative at (x_0, y_0); call this m.
2. Calculate your new x-value, x_1

   $x_1 = x_0 + h$
3. Calculate the y-value, y_1, of the function at x_1:

   $y_1 = mh + y_0$

   - Now we have (x_1, y_1)
4. Let (x_1, y_1) be our new (x_0, y_0), and return to step 1.
5. Repeat the loop until you have reached your target x value.

Rev. 9/26/24