

## Euler's Method

- Given the differential equation  $\frac{dy}{dx} = 2x - y$  and  $y(0) = 2$ , find an approximation for  $y(1)$  using Euler's method with two equal steps
- Given the differential equation  $\frac{dy}{dx} = 3x^2$  and  $y = 2$  when  $x = 1$ , find an approximation for  $y$  when  $x = 2$  by using Euler's method with two equal steps.
- A continuous function  $f$  and its derivative  $f'$  have values according to the table below. Use Euler's method to find the value of  $f(2)$ .

$x$	<b>1.0</b>	<b>1.5</b>	<b>2.0</b>
$f'(x)$	2.0	2.5	3.2
$f(x)$	3		

- Given the differential equation  $\frac{dy}{dx} = \frac{x}{y}$  and  $y(2) = 1$ , find an approximation of  $y(3)$  using Euler's method and  $\Delta x = 0.5$
- Given  $\frac{dy}{dx} = x - 2y$  and  $y(1) = 0$ , find an approximation of  $y(2)$  using two equal steps in Euler's method.
- A function  $f$  and its derivative  $f'$  have values according to the table below. Use Euler's Method with two equal steps to approximate the value of  $f(4.4)$ .

$x$	<b>4</b>	<b>4.2</b>	<b>4.4</b>
$f'(x)$	-0.5	-0.3	-0.1
$f(x)$			4

- A curve passing through  $(2,0)$  satisfies the differential equation  $\frac{dy}{dx} = 4x + y$ . Find an approximation for  $y(3)$  using Euler's method with two steps.
- Let  $y = f(x)$  be the particular solution to the differential equation  $\frac{dy}{dx} = 2y + x$  with the initial condition  $f(0) = 1$ . Use Euler's Method starting at  $x = 0$  with two steps of equal size to approximate  $f(-0.6)$ .
- $y = f(x)$  satisfies the differential equation  $\frac{dy}{dx} = \sqrt{e^x + 2e^y}$ . Given that  $f(2.5) = 0$ , use five iterations of Euler's method to estimate the value of  $f(3) = 0$ .
- The differential equation  $\frac{dy}{dx} = \ln(x^2 + y^2)$  has a particular solution that passes through  $(e, 2)$ . Use of the approximation formula gives  $y_1 = 2.4$ . Determine the value that was used for the step size. Use this value to find  $y_2$  and  $y_3$ .