Euler's Method

Euler's method is used to solve ordinary differential equations. Ordinary Differential Equations have a wide application for example in dynamical and electrical systems. Euler's methods can be applied to a first order equation or to higher order equations through first resolving them to systems of first order equations. Let us consider applying Euler's method to the following first order ordinary differential equation:

$$\frac{dx}{dt} = f(t,x)$$

In any t-interval $t_{n-1} \le t \le t_n$ Euler's method advances the solution x(t) from $x_{n-1} \approx x(t_{n-1})$ to $x_n \approx x(t_n)$. Euler's method advances the solution using the relation:

$$x_n = x_{n-1} + k\, f(t_{n-1}, x_{n-1})$$

This methods are applied to the test problems

$$\frac{dx}{dt} = t \quad \text{with } x(0)=0,$$

$$\frac{dx}{dt} = x \quad \text{with } x(0)=1.$$

which have analytic solutions $x=t^2/2$ and $x=e^t$ respectively.

The spreadsheets can be downloaded from the webpage
http://www.numerical-methods.com/Euler