

ODE Solving - Falling Object

Assuming that drag is proportional to the square of velocity, we can model the velocity of a falling object with the following differential equation:

$$\frac{dv}{dt} = g - \frac{c_d}{m} v^2 \qquad \frac{dx}{dt} = -v$$

v = velocity (m/s)

t = time (s)

g = acceleration due to gravity (m/s²) = 9.81

c_d = second order drag coefficient (kg/m) = 0.225

m = mass (kg) = 90

Solve for the velocity and distance fallen.

Calculate, with $h = 0.2$, the first two time steps

using ... with initial height of 1 km

a) Euler's Method

b) 4th-order RK Method