Worksheet 1

Problem 1 Numerically integrate the following equation of motion

$$\frac{d^2\theta}{dt^2} = -k\ \theta \tag{1}$$

using Euler and Euler-Cromer methods and plot the total energy as a function of time. Choose any value of k and check for 3 different initial conditions (initial energies).

Problem 2 Numerically integrate the equation of motion of a pendulum

$$\frac{d^2\theta}{dt^2} = -k\ \sin\theta \tag{2}$$

using Verlet algorithm. Show that the error in velocity is $\propto \mathcal{O}(\Delta t^2)$.