From Wikipedia--
The most widely known member of the Runge–Kutta family is generally referred to as "RK4", the "classic Runge–Kutta method" or simply as "the Runge–Kutta method".

Let an initial value problem be specified as follows:

$$\dot{y} = f(t, y), \quad y(t_0) = y_0$$

Here *y* is an unknown function of time, which we would like to estimate. We are told that that $\dot{y}$, the rate at which *y* changes, is a function of *t* and of *y* itself. The function *f* and the initial conditions are given. Pick a step-size $h > 0$ and define

$$y_{n+1} = y_n + \frac{h}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$t_{n+1} = t_n + h$$

where

$$k_1 = f(t_n, \; y_n)$$

$$k_2 = f\left(t_n + \frac{h}{2}, \; y_n + h \cdot \frac{k_1}{2}\right)$$

$$k_3 = f\left(t_n + \frac{h}{2}, \; y_n + h \cdot \frac{k_2}{2}\right)$$

$$k_4 = f(t_n + h, \; y_n + h \cdot k_3)$$

Here y_{n+1} is the RK4 approximation of $y(t_{n+1})$, and the next value y_{n+1} is determined by the present value y_n plus the weighted average of four increments, where each increment is the product of the size of the interval, *h*, and an estimated slope specified by function *f* on the right-hand side of the differential equation.

For HW1, if you define *y* to be the satellite's state vector, which is 6×1,

$$\mathrm{y} = (r, \dot{r})$$

with known initial condition y_0, then you can arrive at

$$\dot{y} = (\dot{r}, \ddot{r}) = f(t, y)$$

where the acceleration vector $\ddot{r}$ can be evaluated at every integration step according to equations (3.129)-(3.131). Write a program and select a step-size *h*, and you shall be able to start the orbit integration process.