Exercise 5.1: Run the program created in in-class Exercise 4.2(a) for several different values of δt — starting at 0.5 and decreasing in size by factors of 2 until $\delta t < 10^{-4}$ — and investigate how the energy error ΔE, defined as

$$\Delta E(\delta t) \equiv \max_i |E(t_i) - E(0)| ,$$

depends on δt, where $t_i = i\delta t$ and the maximum is computed over all time steps. Specifically, compute the motion up to time $t_{max} = 20$, plot $\log_{10} \Delta E$ against $\log_{10} \delta t$ and determine the slope of the straight line that best fits the data. [Note that the C++/Python function returning $\log_{10}$ is called `log10` — the `log` function returns the natural logarithm (ln or $\log_e$) of its argument.]