

Create a Excel file which does the following:

1. Has a column with times  $t$  in seconds from 0 to 5 s in steps of 0.01 s.
2. Two further columns with vertical velocity and height calculated according to  $v = v_0 - gt$  and  $h = -gt^2/2 + v_0t$  respectively.
3.  $v_0 = 10 \text{ ms}^{-1}$  and  $g$  should be given in a separate cell. (Physically these are an initial velocity and the acceleration under freefall of an object thrown directly upwards, whose subsequent height at a time  $t$  is given by  $h$ .)
4. In a further column add randomly generated term  $n(t)$  to the height  $h_e(t) = h(t) + n(t)$  with  $-1 < n(t) < 1$  to mimic uncertainty.
5. Create a plot and fit a line through the points using the formulae  $h = at^2 + bt + c$ , what are  $a, b, c$ ?
6. Do this for  $g = 9.81 \text{ ms}^{-2}$  (its value on Earth) as well as for the values of  $g$  on the surface of the moon and the surface of Jupiter.

Useful background materials can be found [here](#).

([http://chem.winthrop.edu/faculty/sebhatu/link\\_to\\_webpages/courses/phys2011/Excel\\_tutorial.pdf](http://chem.winthrop.edu/faculty/sebhatu/link_to_webpages/courses/phys2011/Excel_tutorial.pdf))