

Computational Physics Lab: Writing up

Laboratory class attendance

You are reminded that laboratory class attendance is mandatory and that you need to bring a medical certificate to the next Laboratory class when you are absent because of sickness. An attendance register will be kept.

Files needed

At the beginning of each class you will find all the necessary files in the [Computational Laboratory](#) link on the SF local page of the School of Physics website.

Writing up laboratory work

Laboratory class write-ups are due *one week* after you have completed the laboratory.

You must complete the current write-up before beginning the next laboratory class.

The preferred way for you to write up your laboratory work is to use or *MS Word* (or *Open Office Writer* which is available on your Linux account) for both text and graphs. Here are some points to note when writing up:

- Make sure to include a title, your name and the date of submission.
- Write a brief introduction to the practical in your own words. In the introduction you should state the aims of the practical, outline the physics involved and explain how the methods that you use to solve a particular problem work.
- Answer the problems set in the laboratory script. Where these need graphical output from a programme, use the *Gnuplot* programme to plot data in a file generated by the programme. Remember to answer the problems set, do not simply paste graphical output into your writeup.
- Tabulate results when that is appropriate. You can use the Table menu in *MS Word* to generate a table such as this one.

Tolerance	Number of steps required for convergence
10^{-1}	5
10^{-2}	43
10^{-3}	247
10^{-4}	1473

Submitting your write up for marking

- You are encouraged to discuss physics problems in the laboratory script with your neighbours. However, the work that you present in your write up should be entirely your own.
- The preferred way for you to write up your laboratory work is to use a single *MS Word* document for both text and graphs. (Graphs for insertion into *MS Word* documents can be produced using *Gnuplot*, as described below).
- The completed write up can be submitted by emailing it to the person in charge of the laboratory class.

Plotting Graphs

- The data format for *Gnuplot* is a text file containing data in columns, with all columns of equal length. You can produce a data file with 2, 3 or even 10 data columns. For example, to plot column 2 versus column 1 of the file *data.txt*, use the command:

Plot 'data.txt' using 1:2

To plot several data sets use commands such as:

Plot 'data1.txt' using 1:2, 'data2.txt' using 1:2, 'data3.txt' using 1:2

Plot 'data.txt' using 1:2, 'data.txt' using 1:3, 'data.txt' using 1:4

In the first example the data sets are in three different files and in the second example they are in columns 2, 3 and 4 in the same file. In either case the first column contains the ordinate variable, *e.g.* time and the other columns contain the co-ordinate variables such as theta or omega. To produce data output in the correct form for plotting with *Gnuplot* use:

```
fprintf(filename, "%lf\t %lf\n", t, theta)
```

- In order to generate a .png file which can be inserted into your writeup document: (1) plot the graph you want to output as usual (2) type *set output 'filename.png'* <cr> (3) type *set term png* <cr> (4) type *replot* <cr> In order to return *Gnuplot* to its usual state type *set term x11* <cr>

- Pay attention to the need for numerical accuracy in the laboratory work. For example, a step size greater than 0.1 in the Runge-Kutta integration problems (Pendulum Laboratory Class) will result in numerical errors in the trajectory.