

CS1101 Worksheet04 – Group C

06-09-2018

Login to the system. Open a terminal. Create a directory called **Worksheet04** under your home directory. Change to that directory and do all your work there. In particular open a file called **Worksheet04.txt** (using **gedit**) inside this directory where you will write down the answers to all questions asked in this worksheet. At the end of the class, archive the directory **Worksheet04** and upload to welearn. Open gnuplot in the interactive mode by typing **gnuplot** at the Linux prompt.

Warning : please strictly adhere to the instructions above – not doing so may affect your grades!

Q 1) Download the file '**data1.out**' from welearn. Plot the data, along with the coordinate axes, using gnuplot. From the result it should be easy to guess that the data in the file corresponds to the function

$$y(x) = B\sin(mx + \delta)$$

Estimate the values of the constant parameters B, m and δ from the graph without using the 'fit' command. Plot the data from the file and the function $y(x)$ (using the estimated parameters) in the same graph. Export as **Ans1.png**.

Q 2) Download the file 'data2.out' from welearn. It contains four columns of data, which we will call t, x, y and z , respectively.

- (a) In a single graph, plot the dependence of x, y and z versus t . The key should be below the graph and the legends should read 'x vs t' etc.
- (b) $x^2 + y^2 + z^2$ versus t^2 (there should be no key in this and the next few graphs of this question but the axis labels should be properly specified i.e. in this case x-axis label should be t^2 and y-axis label should be $x^2 + y^2 + z^2$)
- (c) $\frac{y}{z}$ versus t
- (d) $x^2 - 10y^2$ versus x^3
- (e) $x^2 - ty$ versus t
- (f) $\frac{1}{x^2 - y^2 + z^2}$ versus $\frac{1}{t}$.

Export each graph in the png format with names of **Ans2a.png** etc.

Q 3) Download the file data3.out from welearn. The file has four columns which list experimental values of four physical variables x, y, z , and w , respectively.

The experiment suggests that this relationship should hold:

$$\frac{w}{x + y} = \alpha z + \beta$$

Plot (and export to .png format) an appropriate graph to check whether this expectation is fulfilled, at least within experimental errors.

Use the **fit** command in gnuplot to estimate the values of the parameters α and β .

Plot and export the data and the best fit line in the same graph.

Q 4) Plot the following parametric curves and export the graphs to png format :

(i) $x(t) = \frac{1-t^3}{1+t^2}, y(t) = \frac{2t^3}{1+t^2}, -10 \leq t \leq +10$

Save the plots as Ans4i.png

(ii) $x(t) = -3\cos^2(t) + 4\cos\left(\frac{3t}{4}\right), y(t) = -3\sin^2(t) + 4\sin\left(\frac{3t}{4}\right), -100 \leq t \leq +100$ (for this curve, you will have to increase the number of samples to ensure that the resulting curve is smooth)
Save the plots as Ans4ii.png