EL2208 Problem Solving with C Lab. Lab #7

Using for loops, plotting data with MATLAB and using program controlled I/O.

Use praktikum.ee.itb.ac.id server as usual.

This week in lab will offer more experience using **for** loops, plotting data with MATLAB and using program controlled I/O. The lab is in two parts with a different method of plotting data for each part. The programs are quite short and will be used to generate data for plotting.

The first program computes **z** in the formula

$$z = 3(1-x)^2 e^{-(y+1)^2 - x^2} - 10\left(\frac{x}{5} - y^5 e^{-x^2 - y^2}\right) - \frac{1}{3} e^{-(x+1)^2 - y^2}$$

Use two **for** loops for this problem. The outer one loops over the **x** coordinate from **x = -5** up to, and including, **x = 5** at intervals of **0.1**. The inner loop goes over the **y** coordinate from **y = -5** up to, and including, **y = 5** at intervals of **0.1**. The output data file is going to be written using the (`fopen/fprintf/fclose`) commands. The program will open a data file called "mesh1.out" and print all the data into that file. For each iteration through the inner loop, print **x**, **y** and **z** in three columns. Do not put any column headings in the output.

Run your program and look at the output data file using **more** command.

Next, start another C file and compute a 2-dimensional **sinc** operation over the same range as used for **x** and **y** in the previous program. The **sinc** function is computed as

$$z = \begin{cases} 1 & ,r = 0 \\ \dfrac{\sin(r)}{r} & ,r \neq 0 \end{cases}$$

where

$$r = \sqrt{x^2 + y^2}$$

The argument to the **sin** function is already in radians so no conversion is necessary.

Print the result as three column like you did for first program. The output will be written to a file called "mesh2.out" using the (`fopen/fprintf/fclose`) commands.

Run your program and look at the output data file using **more** command.

Next, start Gnuplot by typing **gnuplot** on the Linux command line. To plot the first set of data, type the following commands on the Gnuplot prompt line.

```
gnuplot> set xlabel "x";
gnuplot> set ylabel "y";
gnuplot> set zlabel "z";
```

```
gnuplot> splot "mesh1.out" using 1:2:3 with lines
```

The **splot** command takes three using arguments, 1,2, and 3 as **x**, **y** and **z** data, respectively. To see more information about this command, you can type:

```
gnuplot> help splot datafile
```

You can rotate the plot to see the data from different views, just drag it. The plot will rotate with the mouse. **However, this is not recommended to do because of slow network connection.**

Next, plot the data from the second program. Redo the gnuplot commands on mesh1.out for mesh2.out

Show your lab instructor your plots when you are done then submit your code using perl submitter.