

Intro to MATLAB Exercises to be Turned in (PH393 Version)

Assignment #1- Plotting Functions – Gaussians and Lorentzians

A Gaussian function has the mathematical form:

$$Y = Ae^{-\left(\frac{x-c}{w}\right)^2}$$

where A is the amplitude or height of the function, c is the location of the center of the function along the x-axis, and w is related to the width of the peak.

A Lorentzian function has the mathematical form:

$$Y = \frac{A}{w^2 + (x - c)^2}$$

Where A, c, and w are related to the same quantities above though there are some differences.

You are going to make four plots.

Plot 1: Multiple Gaussians

Vary x from -10 to 10 in steps of 0.01. Use an Amplitude A of 10 and a Width w of 1.

You are going to plot 11 Gaussians on the same plot. The centers change by 2 and go from +10 to -10. The colors change and cycle from +10 being yellow to Magenta, Cyan, Red, Green, Blue, Black and then Yellow, Magenta, etc. A clever person can set this up in a loop.

Plot 2: Multiple Lorentzians

Vary x from -10 to 10 in steps of 0.01. Use an Amplitude A of 10 and a Width w of 1.

You are going to plot 11 Lorentzians on the same plot. The centers change by 2 and go from +10 to -10. The colors change and cycle from +10 being yellow to Magenta, Cyan, Red, Green, Blue, Black and then Yellow, Magenta, etc. A clever person can set this up in a loop.

Plot 3: Overlapping Gaussian and Lorentzian #1

Vary x from -10 to 10 in steps of 0.01. Use an Amplitude A of 10, a width w of 1 and a center c of 0. Plot a Gaussian in red and a Lorentzian in blue.

Plot 4: Overlapping Gaussian and Lorentzian #2

Vary x from -10 to 10 in steps of 0.01. Use an Amplitude A of 10, a width w of 2 and a center c of 0. Plot a Gaussian in red and a Lorentzian in blue.

The following pages show what the final plots should look like: However, they are shown portrait mode and smaller sized here; they should be printed landscape mode. They should take up the whole page. You are to match color schemes, use linewidths of 3, font sizes of 14 for axis titles and axis labels, and font sizes of 12 for text annotations with in the graph. Your full-page plots should look exactly like these four plots would look if they were full sized and landscape printed.

The following code might be useful:

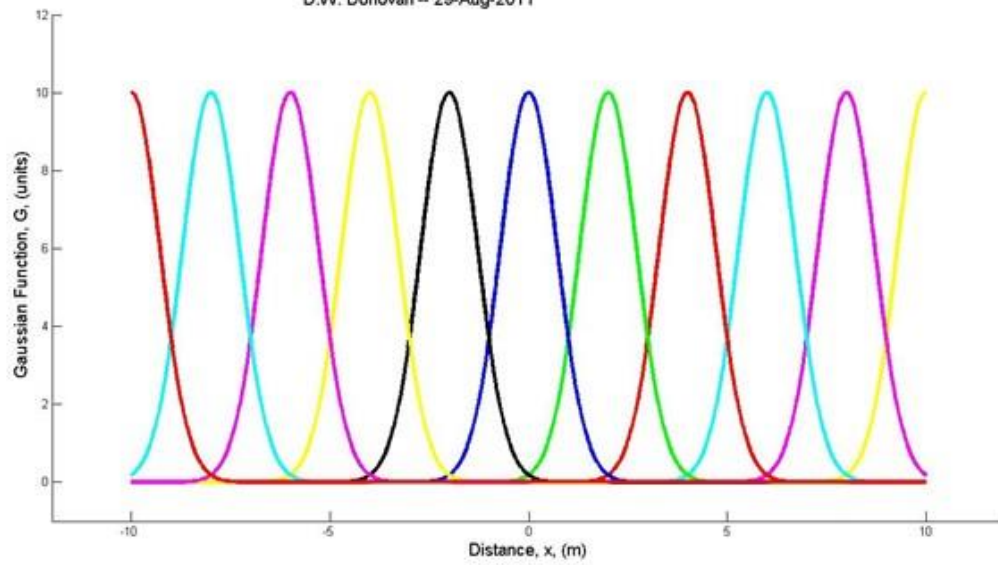
```
cpc= ['y' 'm' 'c' 'r' 'g' 'b' 'k'];
```

```
figure
hold on
for jj = 0:10
    cG = 10-2*jj;
    ppc = mod(jj,7)+1;
    pc = [cpc(ppc) '-'];

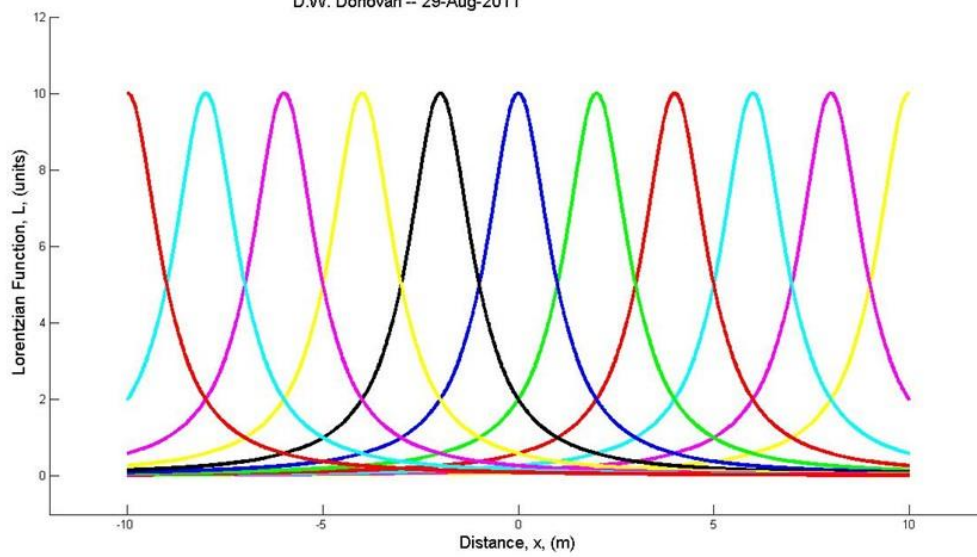
    argG = (x-cG)./wG;
    G = AG*exp(-argG.^2);

    plot(x,G,pc,'LineWidth',3)
end
```

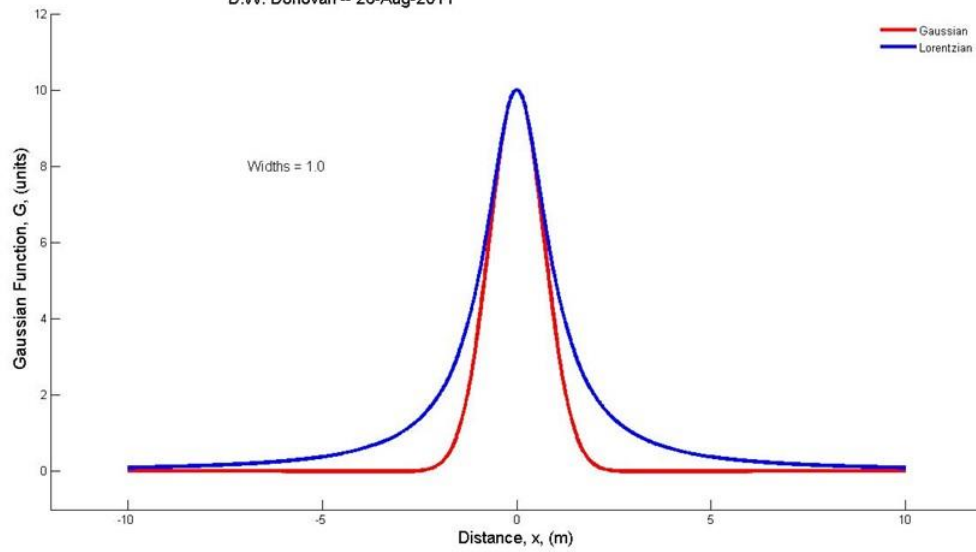
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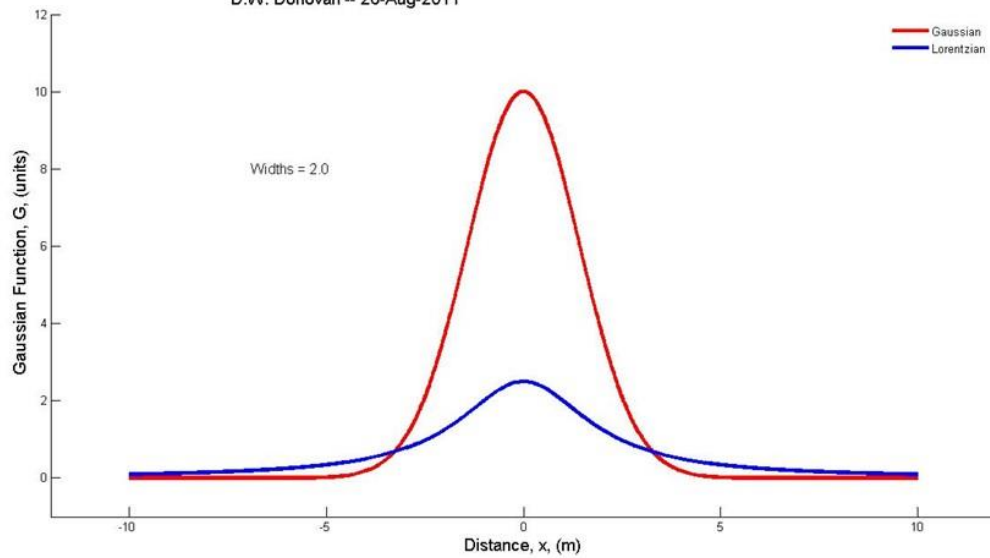
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Assignment #2- Linear Regression

For the set of data points below, plot the data and calculate the best straight line. Plot the line with the data. Be sure to note the slope and y intercept on the graph, as well as in the m-file. Use LineWidth of 3, MarkerSize of 7, and FontSize of 14 for title and axis labels.

X	Y
-12.0000	81.3981
-10.2000	73.8329
-8.4000	59.7875
-6.6000	59.2756
-4.8000	53.5547
-3.0000	45.0874
-1.2000	54.3734
0.6000	31.0765
2.4000	27.9205
4.2000	20.5304
6.0000	11.5425
7.8000	12.4154
9.6000	6.0246
11.4000	12.5113
13.2000	-5.4683

Assignment #3 - Solving Simultaneous Equations

Solve the system of equations given below. Find the values of the variables ($x_1 - x_5$) and show that they do indeed solve the set of equations

$$x_1 + x_2 - x_3 + x_5 = 10$$

$$x_3 + x_4 - x_5 = 0$$

$$3x_1 - 5x_2 = 14$$

$$15x_2 - 6x_3 - 8x_4 = 11$$

$$x_1 + 2x_2 - 6x_3 + 9x_5 = 4$$

Items to turn in:

An email with an attachment, which is **A single zip file**, properly named, containing 3 m-files which solve the three assigned activities. Where needed be sure there is a comment block at the end of the m-file containing the answers to the assignment. For example the values of x_1 through x_5 provided in a properly formatted way for assignment #3.

