

PERI INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ECE
**TWO DAYS NATIONAL LEVEL WORKSHOP ON
COMMUNICATIONS & IMAGE PROCESSING "CIPM 2017"**

Matlab Fun - 2

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What? Matlab can be fun

This is an example using the Matlab publishing feature. You may use this feature when turning in any homework that has a computational aspect.

Here we will go over some basic commands in Matlab. Again if you are unfamiliar with Matlab, I highly recommend searching for tutorials online or making an appointment with me. Furthermore, I always recommend that you use the Matlab "help" command or go to help>Product Help and keep the help window open where you can look up the uses and definitions of all Matlab internal functions.

First we will play around with the plotting command.

Plot the Sine Function

To plot the sine function, we will use the command plot(x,y) where x and y are vectors.

First, we define a vector of points where we will evaluate the sine function

```
x=0:.01:2*pi;
```

This creates a vector of points that starts at 0 and continues in increments of .01 until it reaches the value 2*pi. This is equivalent to using a for loop in the following way

```
dx=.01; N=floor(2*pi/dx)+1; x=zeros(N,1);  
for j=2:N  
    x(j)=(j-1)*dx;  
end
```

Where dx is the increment, N is the total number of points from 0 to 2*pi in increments of dx, and the zeros(N,1) command creates an Nx1 vector of zeros that we fill in with the subsequent for loop.

Note that in Matlab, any command that ends with a ; is suppressed

```
r=1;
```

Not including the ; will cause Matlab to output the command

```
r=1
```

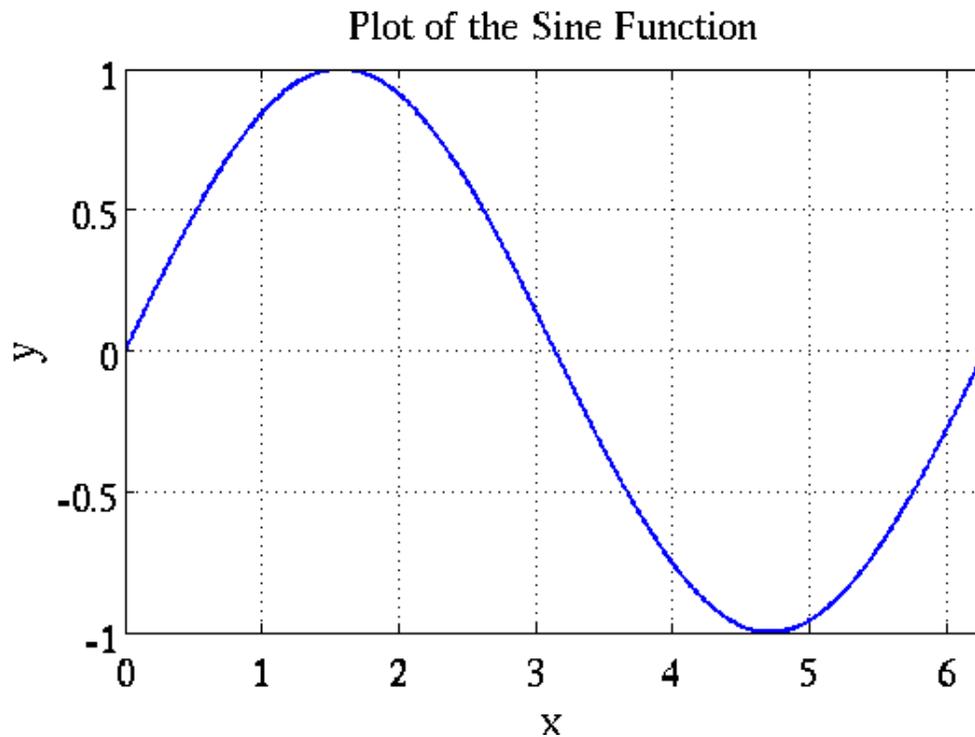
```
r =  
    1
```

We can evaluate the sine function at the values in the vector x by

```
y=sin(x);
```

Now, we plot sine function

```
plot(x,sin(x),'linewidth',2)  
axis([0 2*pi -1 1]) % Set the plot to display x values from 0 to 2*pi and  
                    % y values from -1 to 1  
grid % plots a grid in the background (not always necessary but can look cool)  
xlabel('x','FontSize',20)  
ylabel('y','FontSize',20)  
title('Plot of the Sine Function') % Title the plot
```



Note that you should always label your axes using the xlabel and ylabel commands.

Plot something more complicated

Lets plot

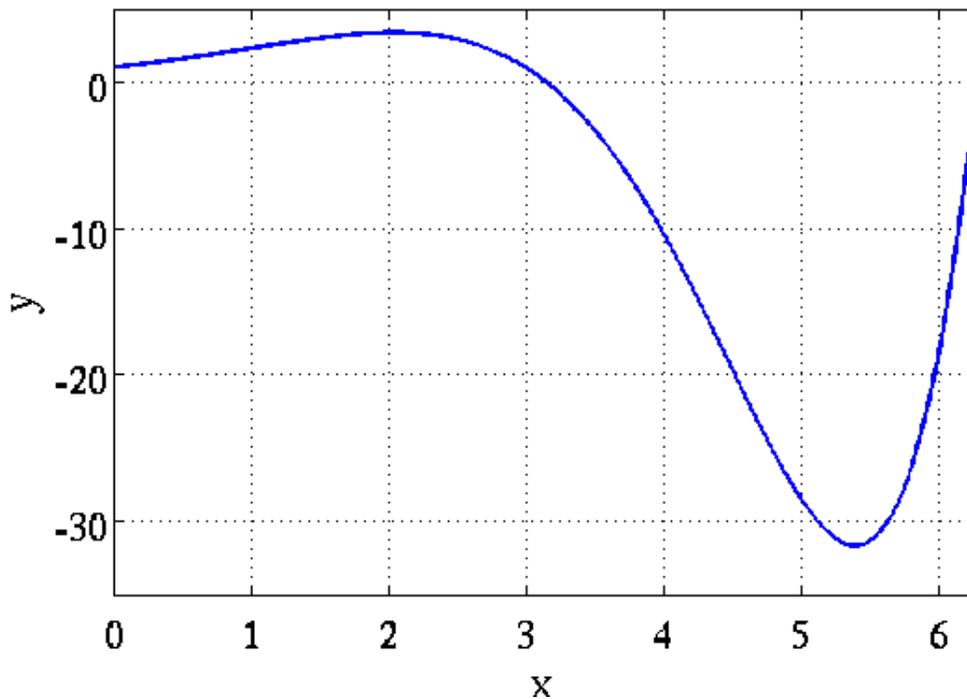
$$y = e^x \frac{\sin(x)}{x}$$

The above function can be plotted in Matlab by

```
x=[0:.01:2*pi];  
y=exp(x).*sin(x)./x;
```

Note that when doing pointwise operations with vectors, use the `.` before the operation, i.e. pointwise multiplication of two vectors `z` and `w` is `z.*w`

```
plot(x,y,'linewidth',2)  
axis([0 2*pi -35 5])  
grid  
xlabel('x','FontSize',20)  
ylabel('y','FontSize',20)
```



Subplots and Legends

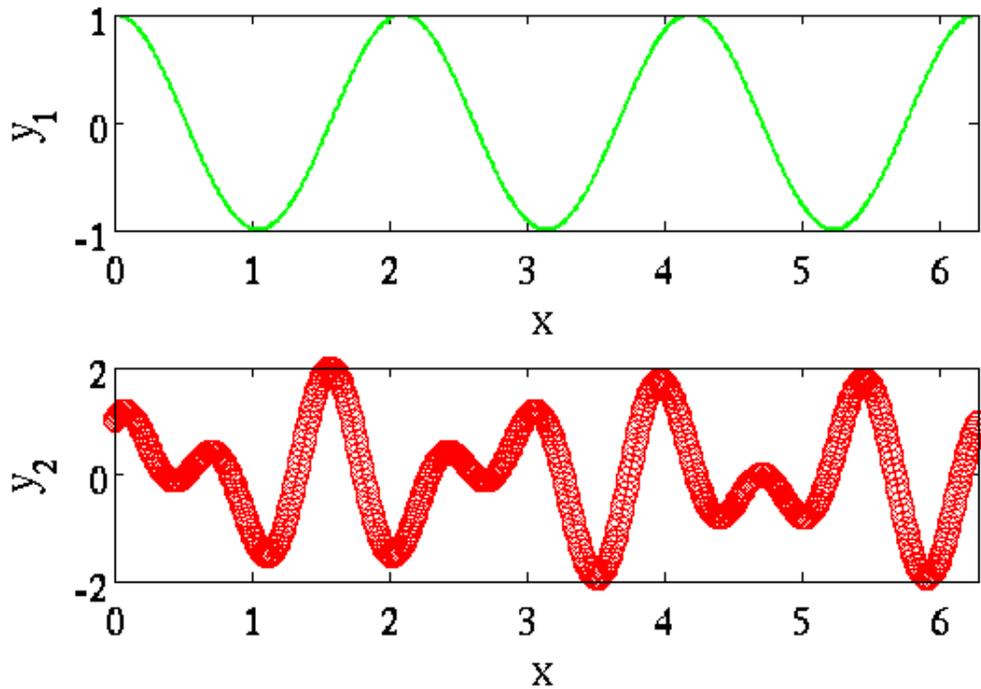
To save space (and trees) Matlab also has a subplot command that allows you to display multiple plots in one window. For example

```
x=0:.01:2*pi;  
y1=cos(3*x);  
y2=sin(5*x)+cos(8*x);  
subplot(2,1,1) % subplot(n,m,p) means you want a grid of nxm plots and p
```

```

% is the number of the plot
plot(x,y1,'linewidth',2,'color','g')
axis([0 2*pi -1 1])
xlabel('x','FontSize',20)
ylabel('y_1','FontSize',20)
subplot(2,1,2)
plot(x,y2,'marker','o','markersize',10,'color','r')
axis([0 2*pi -2 2])
xlabel('x','FontSize',20)
ylabel('y_2','FontSize',20)

```



You can also plot two traces on the same window using the "hold on" command and use different colors or linestyles and use the "legend" command to let the viewer know what they are seeing.

```

figure
plot(x,y1,'linewidth',2,'color','g')
hold on
plot(x,y2,'marker','o','markersize',10,'color','r')
axis([0 2*pi -2 2])
xlabel('x','FontSize',20)
legend('y_1','y_2')

```

