Day 3 - MATLAB® Plotting data

Plotting Data

MATLAB® has a simple plot statement that will plot two vectors which have the same length.

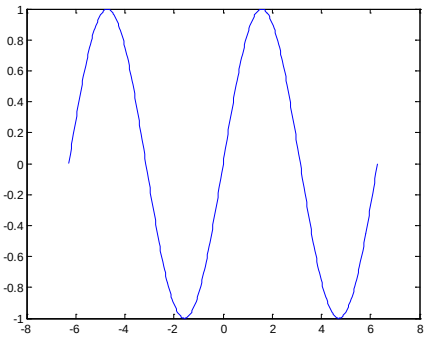
For example

```
t = -2*pi:pi/100:2*pi;
y = sin(t);
```

creates a vector t which goes from -2π to +2π in steps of π/100 and y is a vector of the same length which represents the sine of t. To see this in a plot we do the following:

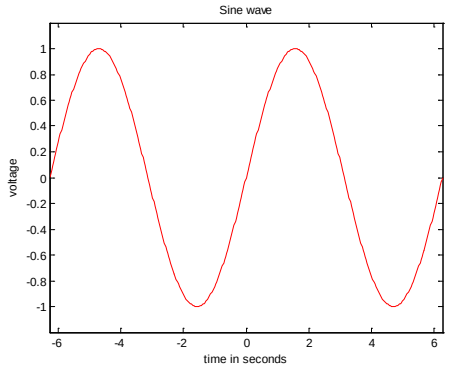
```
t = -2*pi:pi/100:2*pi;
y = sin(t);
plot(t, y);
```

Produces the following plot:



We can add several other items to make this look "prettier". axis, xlabel, ylabel, and title

```
%PlotExample1.m
t = -2*pi:pi/100:2*pi;
y = sin(t);
figure(1);clf;
plot(t, y, 'r');
axis([-2*pi 2*pi -1.2 1.2]);
xlabel('time in seconds');
ylabel('voltage');
title('Sine wave');
```

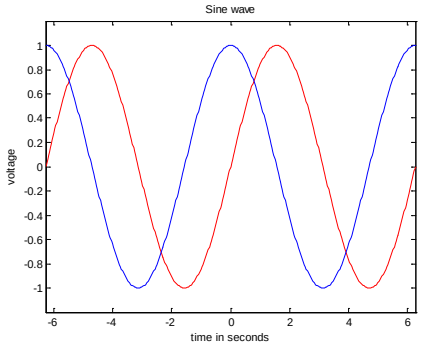


Plot $y = e^{-t/5}\sin(t)\cos(t)$ for t = 0 to 6π in steps of 0.01.

```
%DecayingSinusoid.m
t = 0:0.01:6*pi;
y = exp(-t/5).*sin(t).*cos(t);
figure(1);clf;
plot(t, y);
```

Plotting two or more graphs on the same axis

```
%PlotExample1.m
t = -2*pi:pi/100:2*pi;
y1 = sin(t);
y2 = cos(t);
figure(1);clf;
plot(t, y1, 'r');
hold on;
plot(t, y2, 'b');
axis([-2*pi 2*pi -1.2 1.2]);
xlabel('time in seconds');
ylabel('voltage');
title('Sine wave');
```



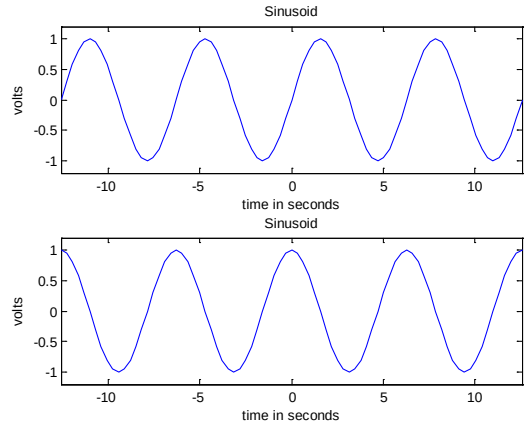
Plot $y_1 = e^{-t/5}$, $y_2 = \sin(t)\cos(t)$, and $y = e^{-t/5}\sin(t)\cos(t)$ on a single plot in three different colors for t = 0 to 6π in steps of 0.01.

```
%DecayingSinusoid.m
t = 0:0.01:6*pi;
y1 = exp(-t/5);
y2 = sin(t).*cos(t);
y3 = exp(-t/5).*sin(t).*cos(t);
figure(1);clf;
plot(t, y1, 'k');
hold on
plot(t, y2, 'b');
plot(t, y3, 'r');
```

Subplots can be used to get multiple plots in one figure

```
%PlotExmp.m
t = -4*pi:pi/10:4*pi;
y1 = sin(t);
y2 = cos(t);
```

```
figure(1);clf;
subplot(2, 1, 1);
plot(t, y1);
axis([-4*pi 4*pi -1.2 1.2]);
title('Sinusoid');
xlabel('time in seconds');
ylabel('volts');
subplot(2, 1, 2);
plot(t, y2);
axis([-4*pi 4*pi -1.2 1.2]);
title('Sinusoid');
xlabel('time in seconds');
ylabel('volts');
```

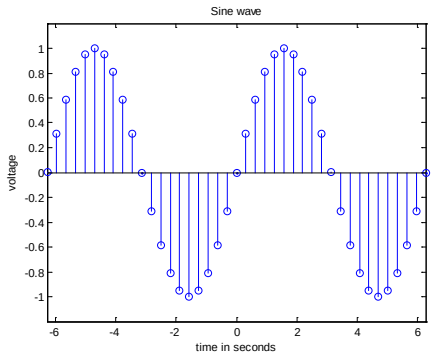


Plot $y = e^{-5/\tau}\sin(t)\cos(t)$ **where τ = 1, 3, 5, 7, 9, and 11 on six different subplots with three rows and two columns. Let t = 0 to 6π in steps of 0.01.**

```
%DecayingSinusoid2.m
t = 0:0.01:6*pi;
figure(1);clf;
for i=1:6
    tau = 2*i-1;
    y = exp(-t/tau).*sin(t).*cos(t);
    subplot(3, 2, (tau+1)/2);
    plot(t, y);
end
```

For discrete data we often use the stem function in place of plot.

```
%PlotExample1.m
t = -2*pi:pi/10:2*pi;
y = sin(t);
figure(1);clf;
stem(t, y);
%stem(t, y, 'Markersize', 0);
axis([-2*pi 2*pi -1.2 1.2]);
xlabel('time in seconds');
ylabel('voltage');
title('Sine wave');
```


Sine wave
voltage
time in seconds
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-6
-4
-2
0
2
4
6