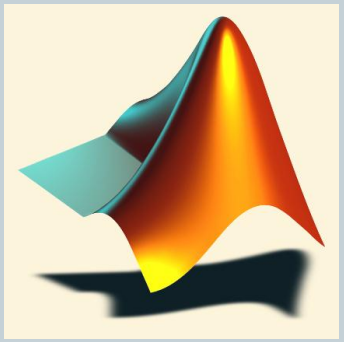
Lecture Series – 7

Plotting in MATLAB

1



Lecture Series by

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PLOTTING

- plot (x, y, 'color style marker')

Command	Result
`grid on/off`	adds a grid to the plot at the tick marks or removes it
`axis([xmin xmax ymin ymax])`	sets the minimum and maximum values of the axes
`box off/on`	removes the axes box or shows it
`xlabel('text')`	plots the label text on the x axis
`ylabel('text')`	plots the label text on the y axis
`title('text')`	plots a title above the graph
`text(x,y,'text')`	adds text at the point (x,y)
`gtext('text')`	adds text at a manually (with a mouse) indicated point
`legend('fun1','fun2')`	plots a legend box (move it with your mouse) to name your functions
`legend off`	deletes the legend box
`clf`	clear the current figure
`subplot`	create a subplot in the current figure

- Other commands - semilogx, semilogy, axis, colordef,

Formatting The Plot

Color		Marker		Style	
b	blue	.	point	-	solid
g	green	o	circle	:	dotted
r	red	x	x-mark	-.	dashdot
c	cyan	+	plus	--	dashed
m	magenta	*	star	(none)	no line
y	yellow	s	square		
k	black	d	diamond		
		v	triangle (down)		
		^	triangle (up)		
		<	triangle (left)		
		>	triangle (right)		
		p	pentagram		
		h	hexagram		

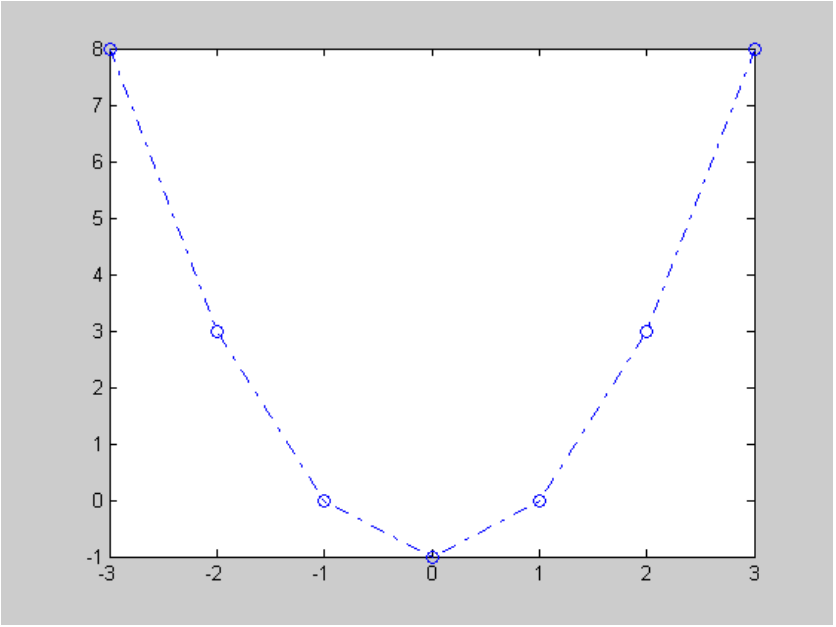
Plot

PLOT Linear plot.

- PLOT(X,Y) plots vector Y versus vector X
- PLOT(Y) plots the columns of Y versus their index
- PLOT(X,Y,S) with plot symbols and colors

Example

```
x = [-3 -2 -1 0 1 2 3];
y1 = (x.^2) -1;
plot(x, y1,'bo-.');
```



Plot Properties

XLABEL X-axis label.

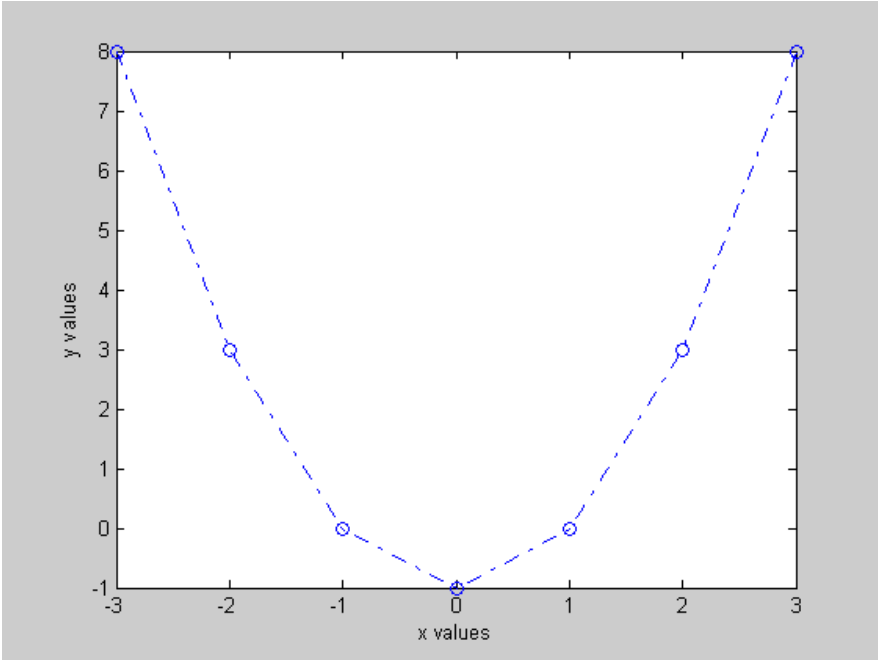
- XLABEL('text') adds text beside the X-axis on the current axis.

YLABEL Y-axis label.

- YLABEL('text') adds text beside the Y-axis on the current axis.

Example

```
...
xlabel('x values');
ylabel('y values');
```



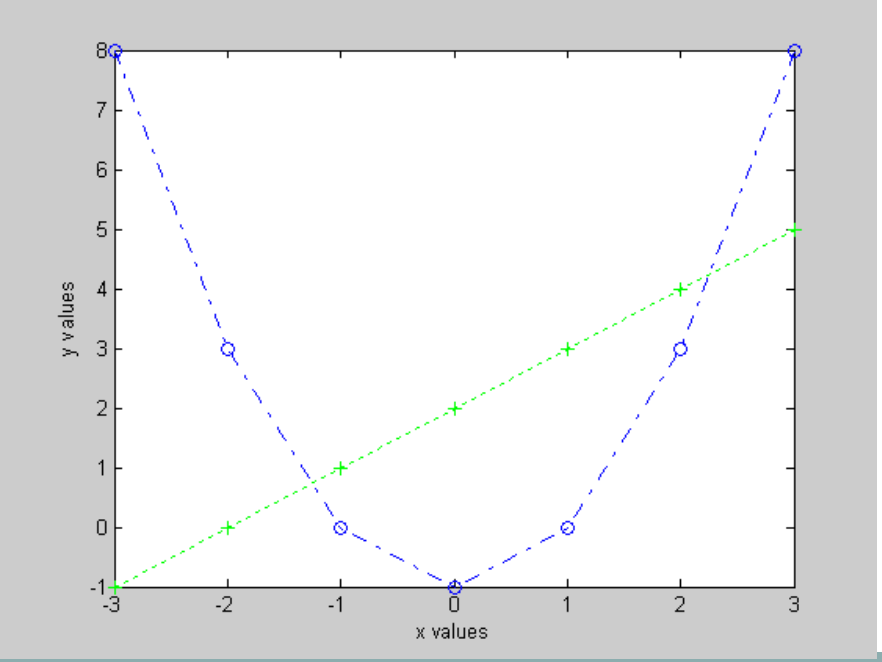
Hold

HOLD Hold current graph.

- HOLD ON holds the current plot and all axis properties so that subsequent graphing commands add to the existing graph.
- HOLD OFF returns to the default mode
- HOLD, by itself, toggles the hold state.

Example

```
...
hold on;
y2 = x + 2;
plot(x, y2, 'g+:');
```



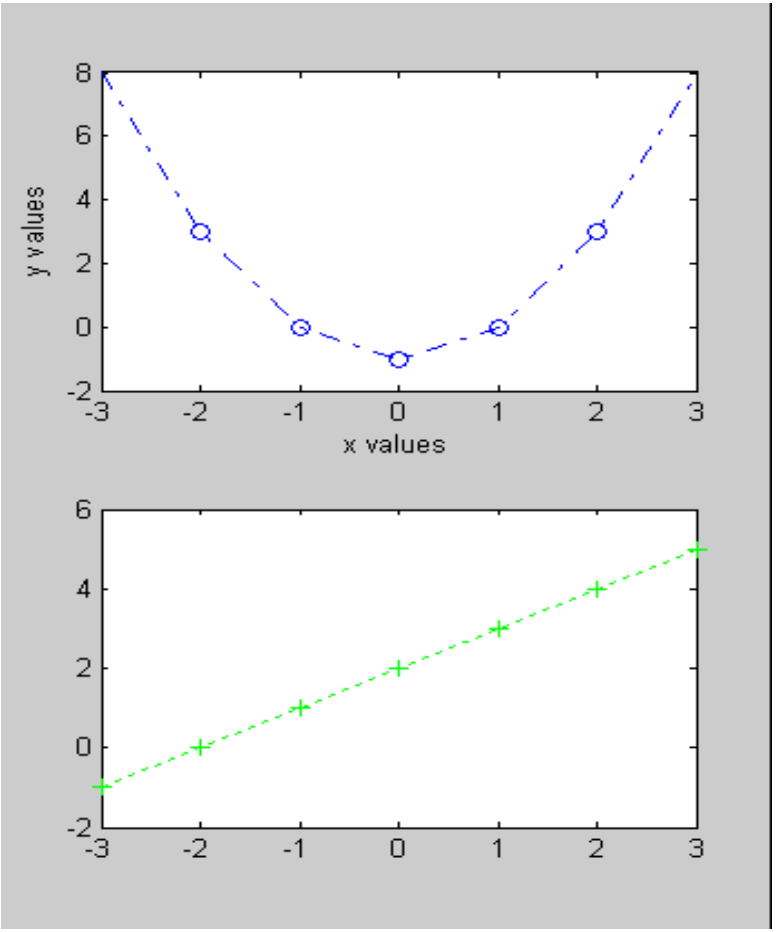
Subplot

SUBPLOT Create axes in tiled positions.

- SUBPLOT(m,n,p), breaks the Figure window into an m-by-n matrix of small axes

Example

```
x = [-3 -2 -1 0 1 2 3];
y1 = (x.^2) -1;
% Plot y1 on the top
subplot(2,1,1);
plot(x, y1,'bo-.');
xlabel('x values');
ylabel('y values');
% Plot y2 on the bottom
subplot(2,1,2);
y2 = x + 2;
plot(x, y2, 'g+:');
```



AXIS Control

- axis scaling and appearance.
- axis([xmin xmax ymin ymax])
- Sets scaling for the x- and y-axes on the current plot.
- axis auto - returns the axis scaling to its default, automatic mode
- axis off - turns off all axis labeling, tick marks and background.
- axis on - turns axis labeling, tick marks and background back on.
- axis equal – makes both axes equal length

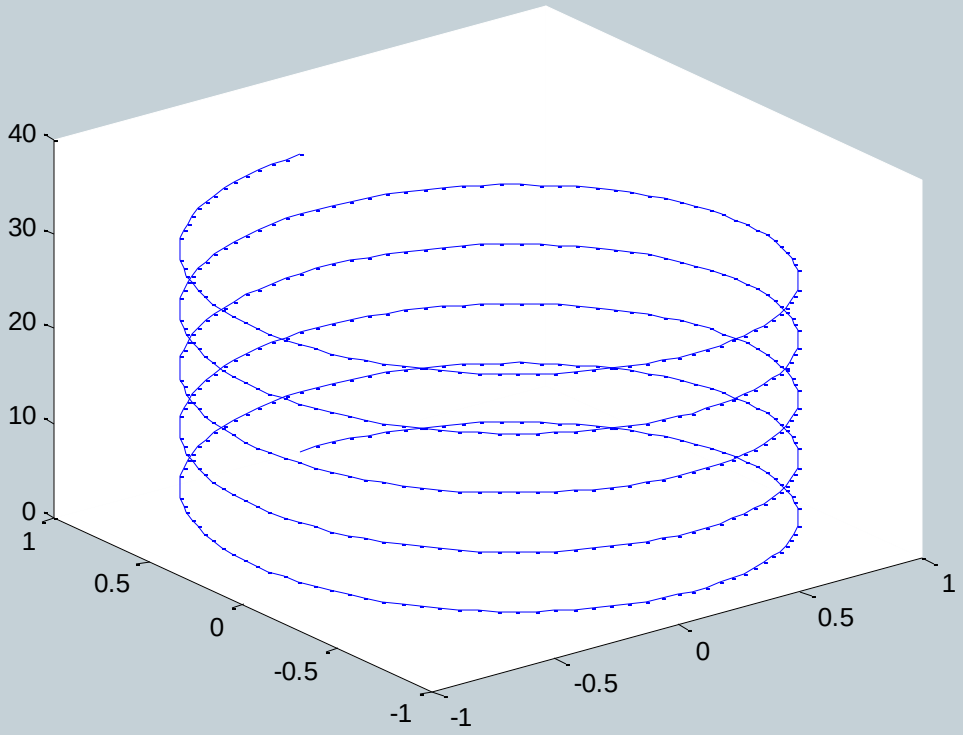
fplot

- fplot(@fun, lims) - plots the function fun between the x-axis limits
- lims = [xmin xmax ymin ymax] – axis limits
- The function fun(x) must return a row vector for each element of vector x.

3D Plots

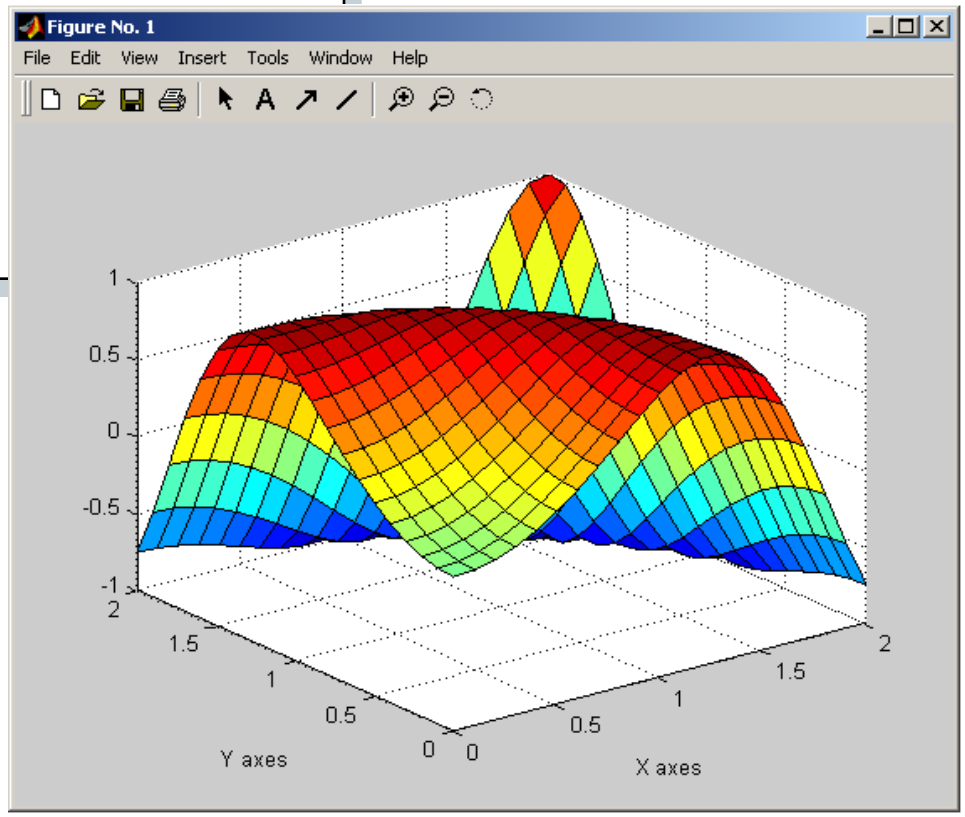
- Contourf
- Colorbar
- Plot3
- Waterfall
- Contour3
- Mesh
- Surf

```
t = 0:pi/50:10*pi;
plot3(sin(t),cos(t),t)
```



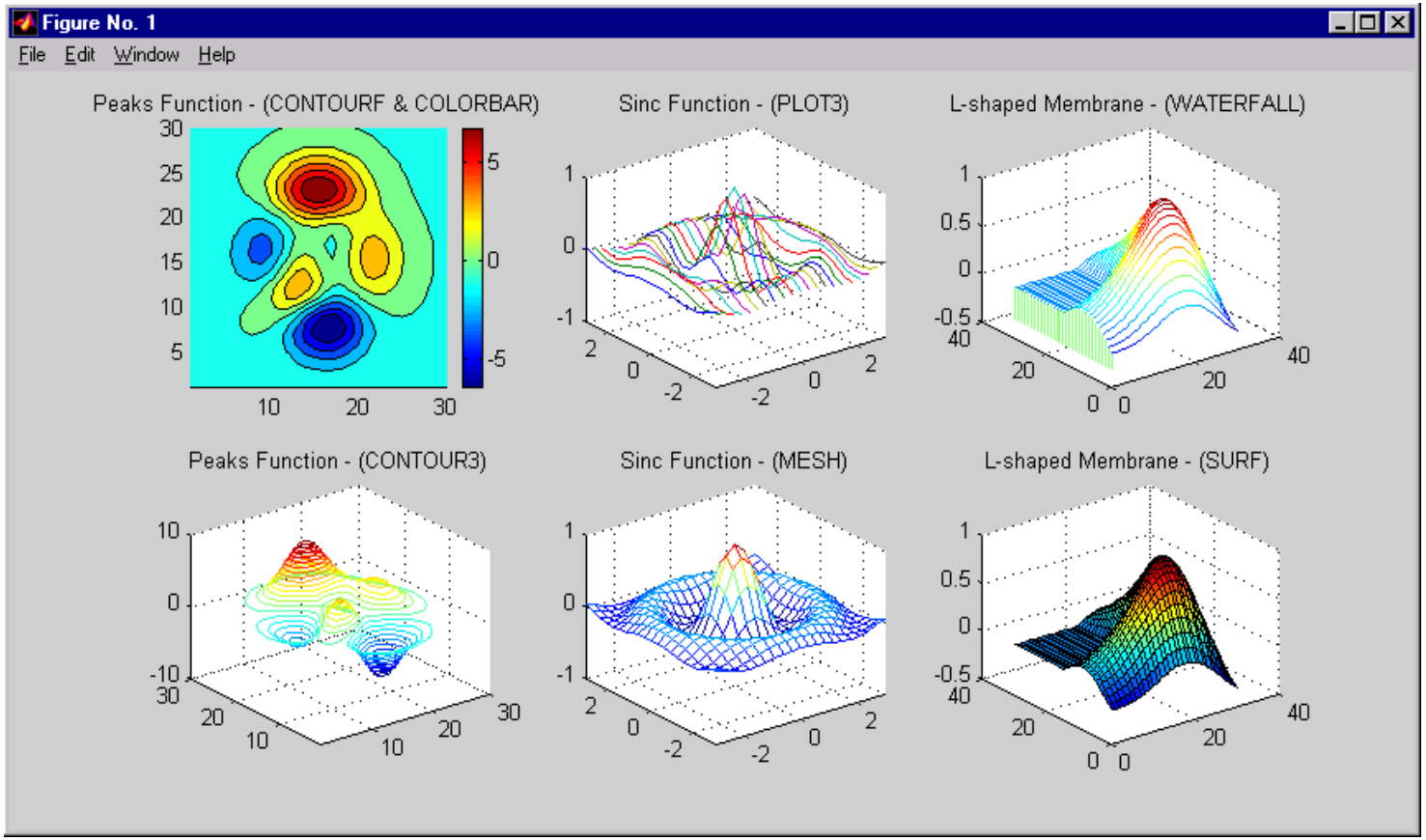
Surface Plot

```
x = 0:0.1:2;
y = 0:0.1:2;
[xx, yy] = meshgrid(x,y);
zz=sin(xx.^2+yy.^2);
surf(xx,yy,zz)
xlabel('X axes')
ylabel('Y axes')
```



3 D Surface Plot

contourf-colorbar-plot3-waterfall-contour3-mesh-surf



Plot the function sin(x) between $0 \leq x \leq 4\pi$

- Create an x-array of 100 samples between 0 and 4π.

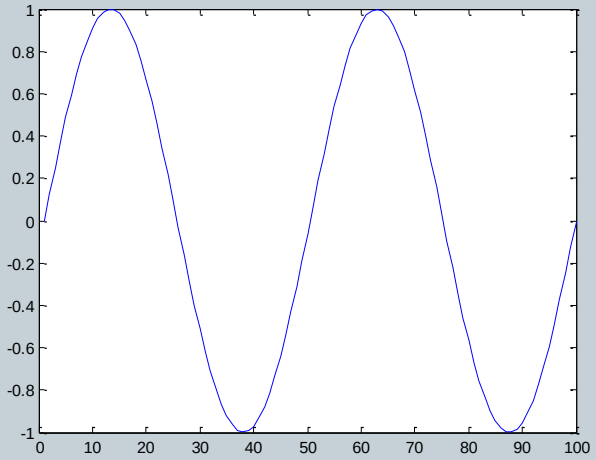
```
>>x=linspace(0,4*pi,100);
```

- Calculate sin(.) of the x-array

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

- Plot the y-array

```
>>plot(y)
```



Display Facilities

- title(.)

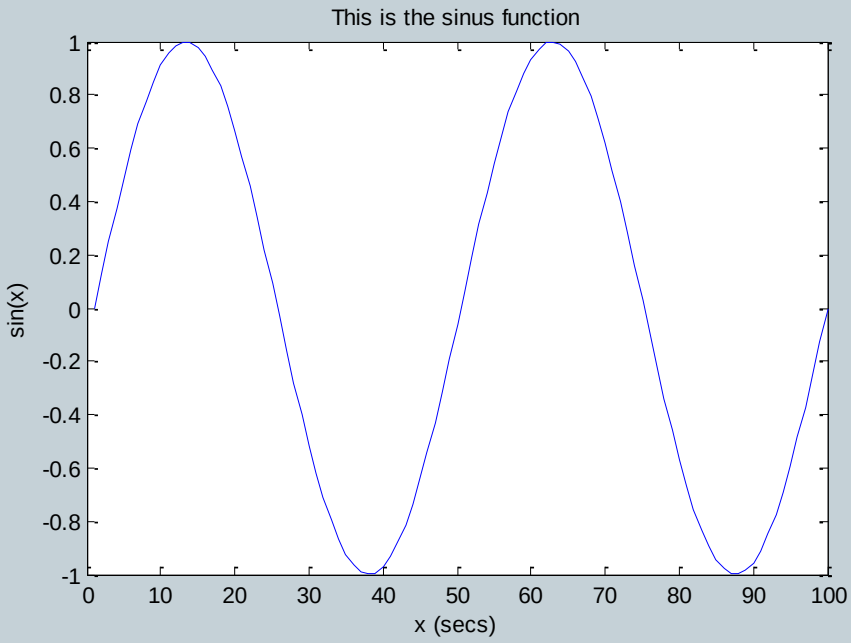
```
>>title('This is the sinus function')
```

- xlabel(.)

```
>>xlabel('x (secs)')
```

- ylabel(.)

```
>>ylabel('sin(x)')
```

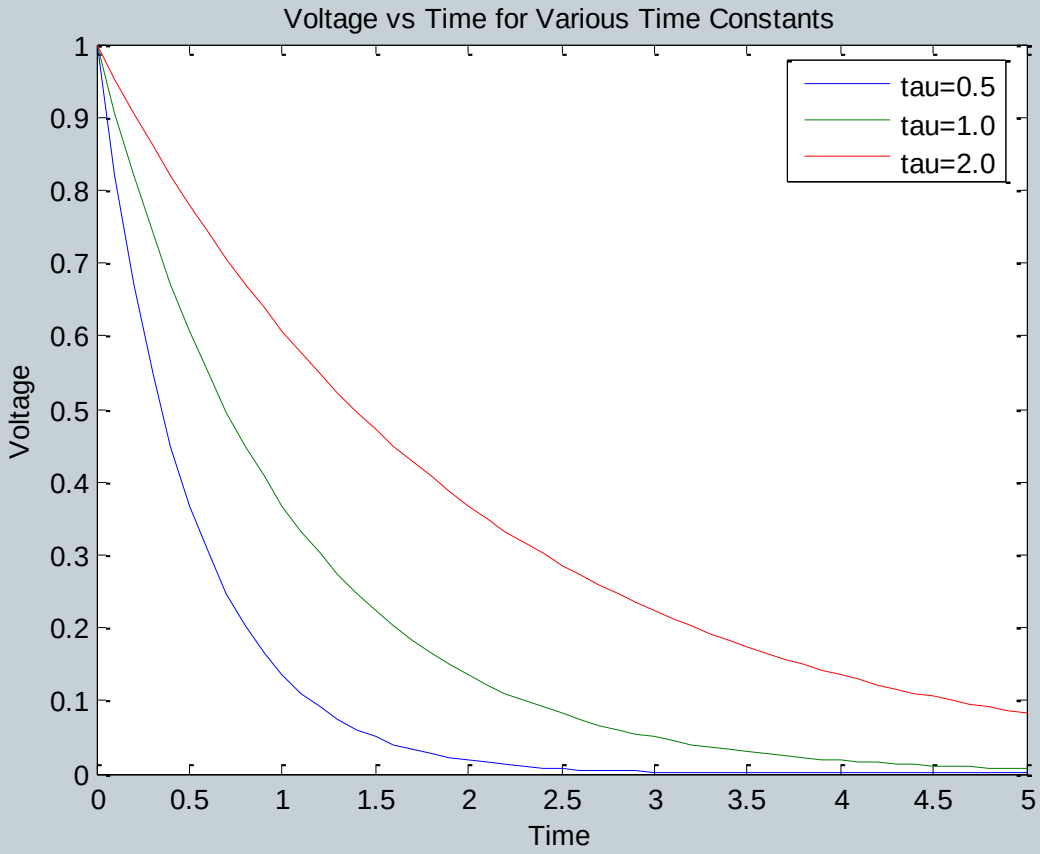


Example

- Plot voltage vs time for various RC time constants

$$\frac{v}{V_0} = e^{-t/\tau}$$

```
time = 0:0.1:5;
tau = [0.5 1.0 2.0];
[TIME TAU] =
meshgrid(time,tau);
V = exp(-TIME./TAU);
plot(time,V)
```



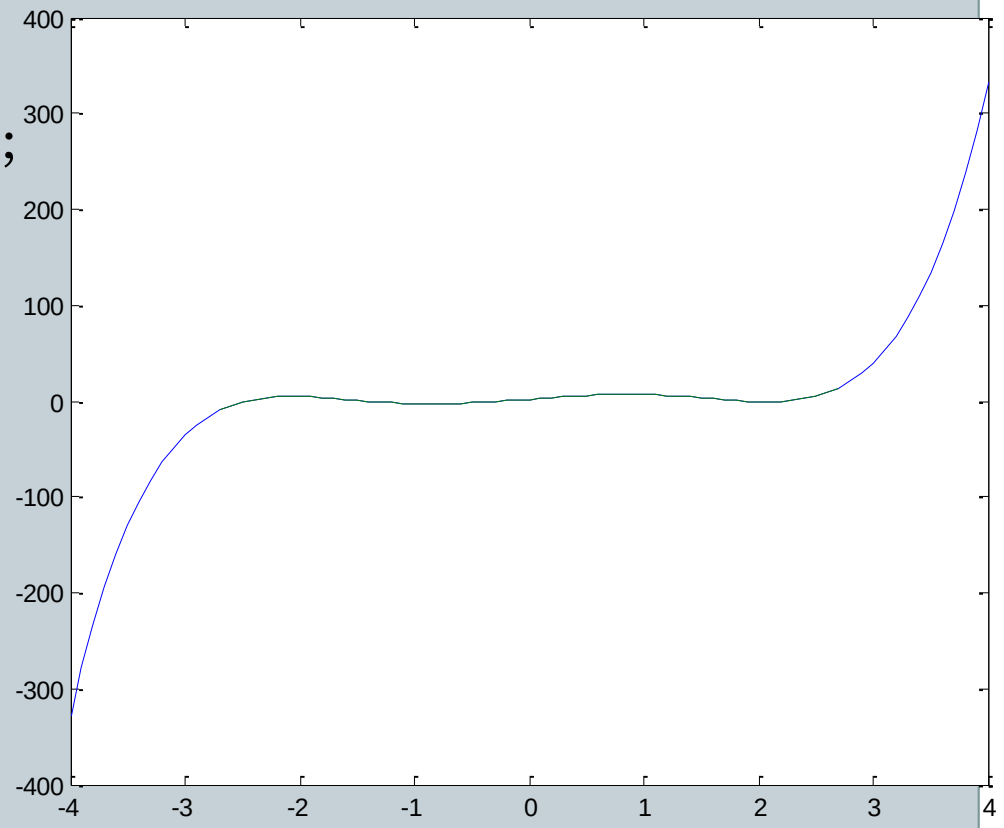
Thanks

Questions ??

Plot a sphere, which is defined as
[x(t, s), y(t, s), z(t, s)] = [cos(t) cos(s), cos(t) sin(s), sin(t)]
for t, s = [0, 2] (use ‘surf’).
Make first equal axes, then remove them. Use ‘shading interp’ to remove black lines

Review Questions

1.
```
x1=-4:0.1:4;
x2 = -2.7:0.1:2.7;
f1 = 0.6*x1.^5-5*x1.^3+9*x1+2;
f2= 0.6*x2.^5-5*x2.^3+9*x2+2;
plot(x1,f1,x2,f2)
grid on
```



4 same as 1

2. f=@(x)(x^2-x+1)/(x^2+x+1);

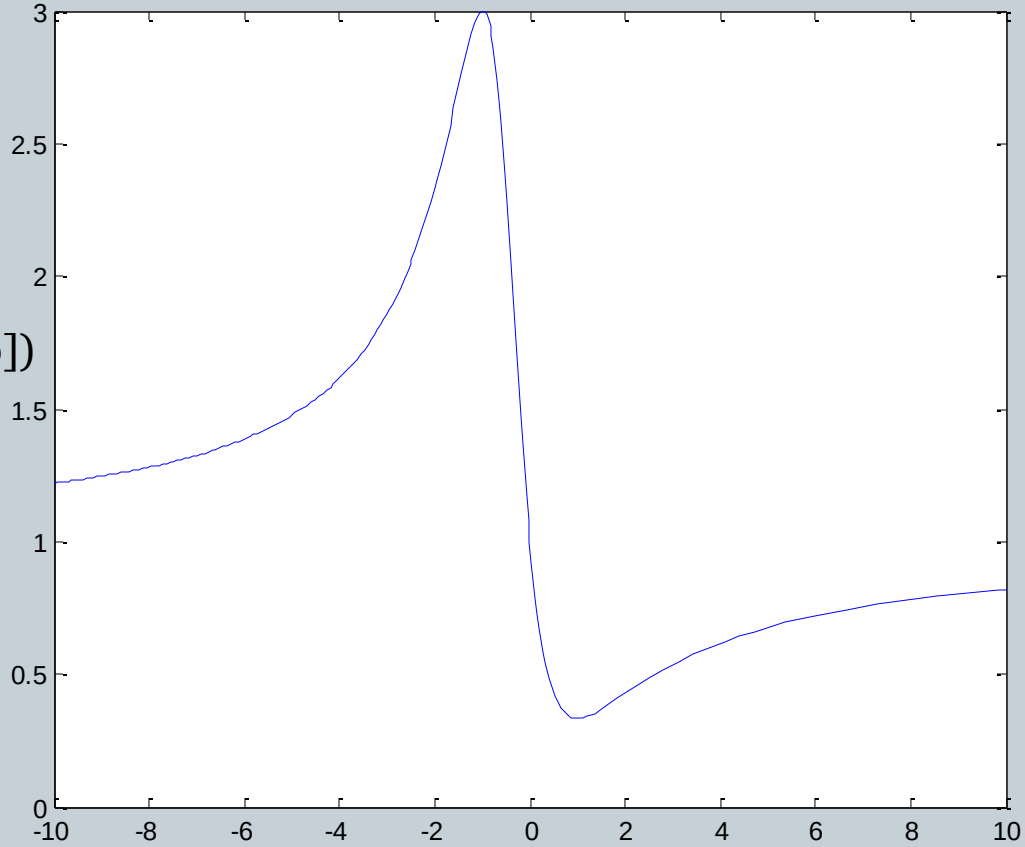
l=[-10 10];

fplot(f,l)

Or

fplot(@(x)(x^2-x+1)/(x^2+x+1),[-10 10])

3. Same as 2



7. RL = 1:0.01:10;
   Vs = 12;
   Rs = 2.5;
   P = (Vs^2*RL)./(RL+Rs).^2;
   plot(RL,P)
   xlabel('Load resistance')
   ylabel('Power dissipated')