PROGRAMMING WITH MATLAB

WEEK 6

PLOTTING

PLOTTING

- Plot:

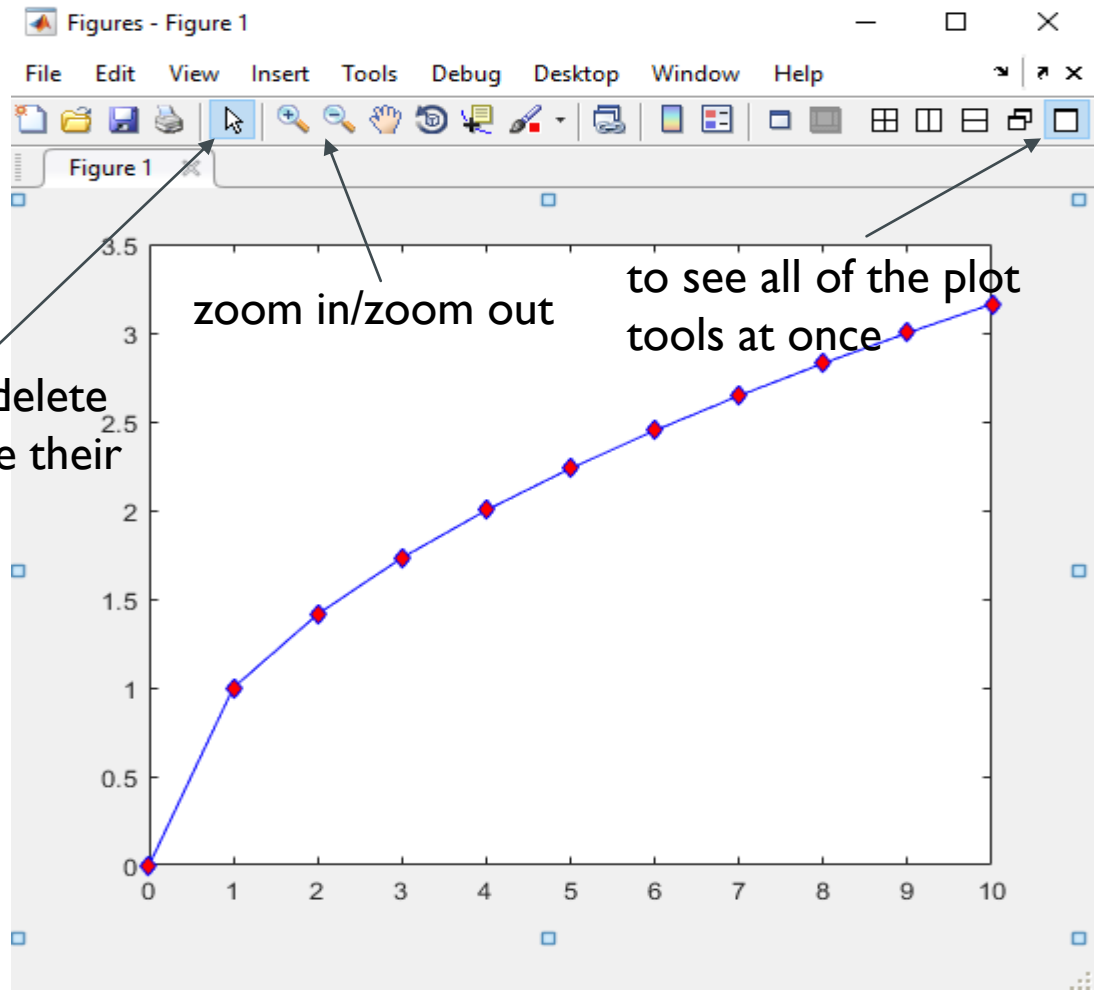
Syntax: plot(x, y, 'r.-')

Color

Marker

Linestyle

- The line color, marker style and line style can be changed by adding a string argument.



PLOTTING

Line Style	Description
-	Solid line
--	Dashed line
:	Dotted line
-.	Dash-dot line

Color	Description
y	Yellow
m	Magenta
c	Cyan
r	Red
g	Green
b	Blue
w	White
k	black

Marker	Description
o	Circle
+	Plus sign
*	Asterisk
.	Point
x	Cross

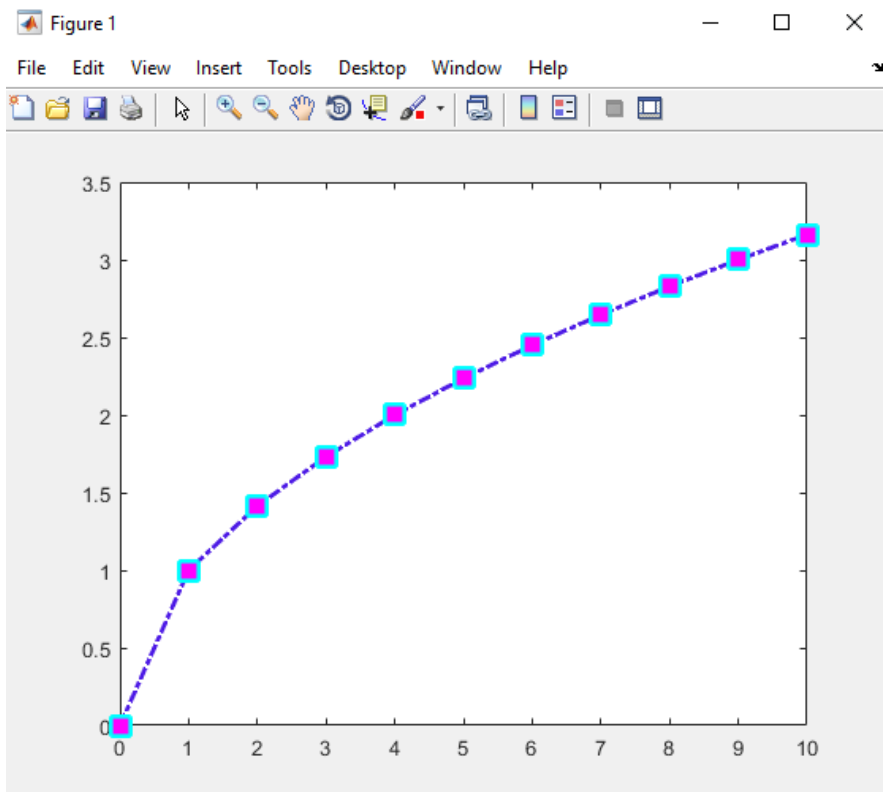
Marker	Description
S	Square
D	Diamond
^	Upward pointing triangle
v	Downward pointing triangle
>	Right pointing triangle

Marker	Description
<	Left pointing triangle
P	Pentagram
h	Hexagram

PLOTTING

- All features related to a line can be customized.

```
>>  plot(x, y, '-.s', 'LineWidth', 2, ...
            'Color', [.3 .1 .9], ...
            'MarkerEdgeColor', 'c', ...
            'MarkerFaceColor', 'm', ...
            'MarkerSize', 12)
```



You can set colors by specifying [R G B] values or by using default color characters such as 'r', 'g'.

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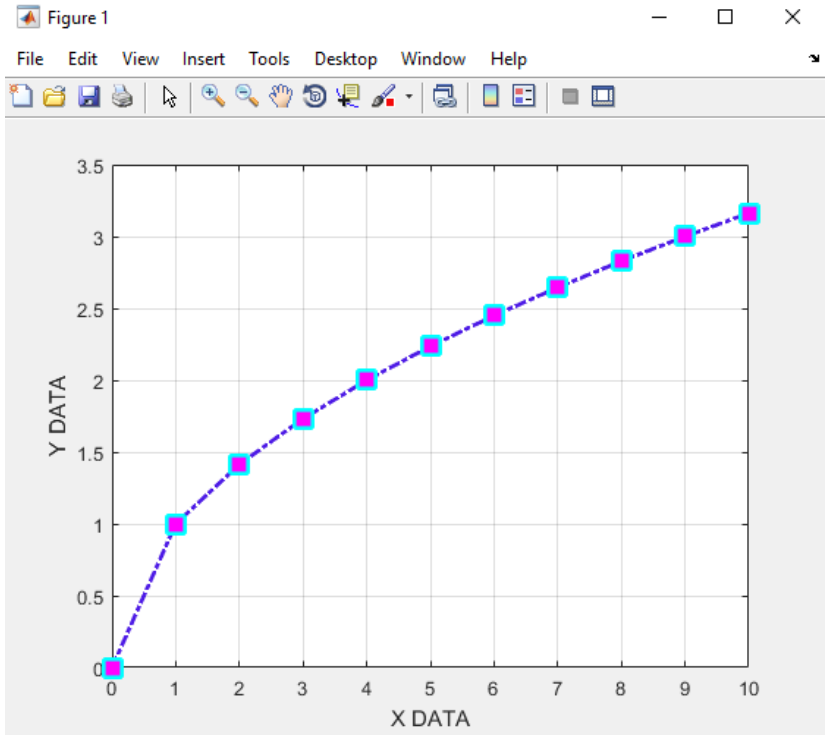
Each axis should be labeled to describe the quantity being drawn and to indicate the unit.

If you plot more than one data set, label each one or use a legend so that they can be distinguished.

The "grid" command displays gridlines at the tick marks corresponding to the tick labels.

Type "grid on" to insert gridlines; type "grid off" to stop drawing grid lines

```
>> plot(x, y, '-.s', 'LineWidth', 2, ...
                'Color', [.3 .1 .9], ...
                'MarkerEdgeColor', 'c', ...
                'MarkerFaceColor', 'm', ...
                'MarkerSize', 12)
>> xlabel('X DATA')
>> ylabel('Y DATA')
>> grid on
```

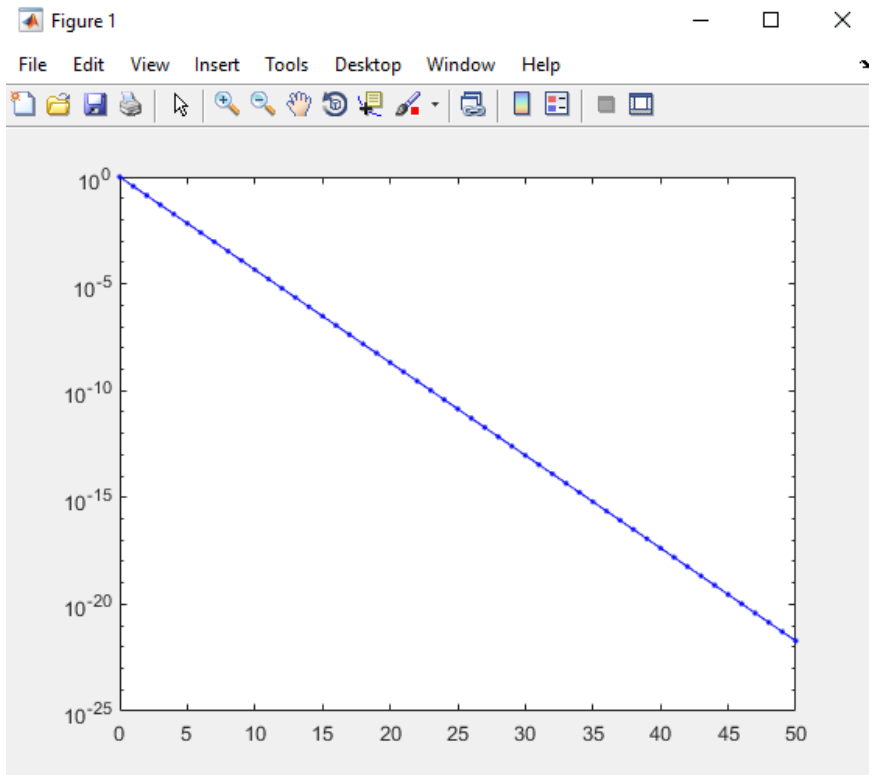


PLOTTING

- semilogx, semilogy, loglog:

Syntax: same as plot command

```
>> semilogx(x,y,’b’);
>> semilogy(y,’r.-’);
>> loglog(x,y);
>> semilogy(x, exp(-x),'b.-')
```



PLOTTING

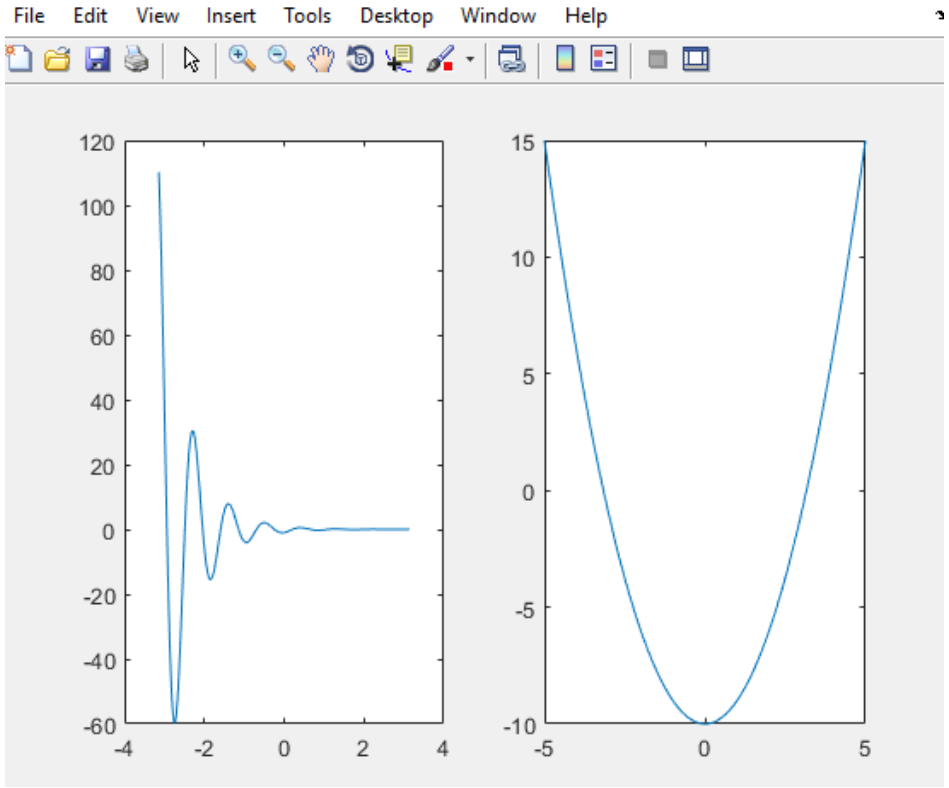
- subplots: The subplot command is used to plot smaller subplots in the same figure.

Syntax: subplot(m,n,p)

This command divides the figure window into rectangular sections with m rows and n columns

The p variable specifies which rectangular area to plot.

```
>> x = -pi:pi/100:pi;
y = exp(-1.5*x).*cos(7*x-3);
subplot(1,2,1)
plot(x,y)
x = -5:0.01:5;
y = x.^2-10;
subplot(1,2,2)
plot(x,y)
```



PLOTTING

- Some specialized plot commands:

bar(x, y) : Creates a bar chart of y versus x

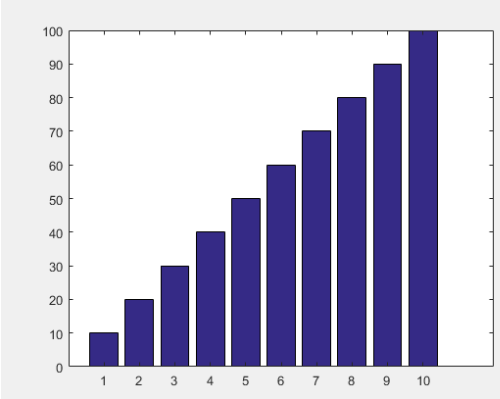
polarplot(theta,rho) : plots a line in polar coordinates, with theta indicating the angle in radians and rho indicating the radius value for each point.

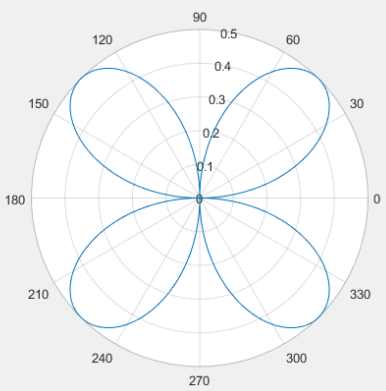
stairs(y) : draws a stairstep graph of the elements in y.

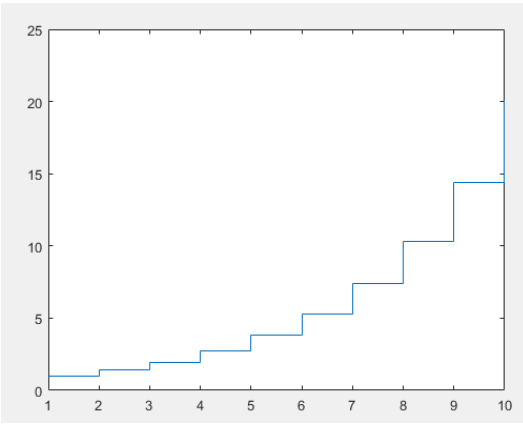
stairs(x,y) plots the elements in y at the locations specified by x.

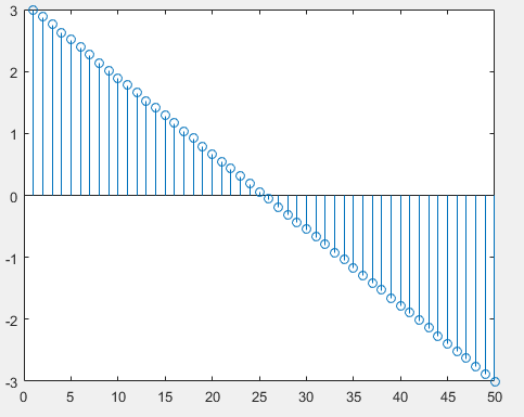
stem(y) : plots the data sequence, y as stems that extend from a baseline along the x-axis.

stem(x,y) plots the data sequence, y, at values specified by x









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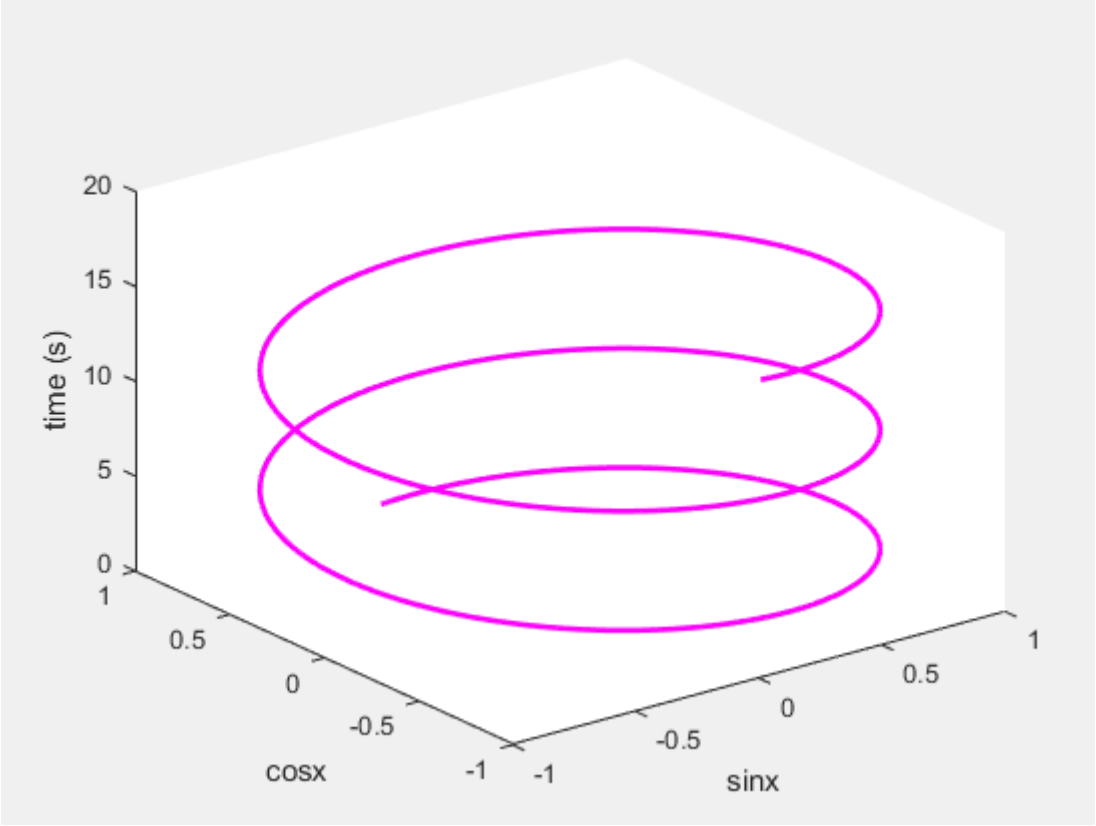
Three-dimensional graphics: plot3

```
>> t = 0:0.01:5*pi;
>> x = sin(t);
>> y = cos(t);
>> z = t;
>> plot3(x,y,z,'m','LineWidth',2);
>> xlabel('sinx')
>> ylabel('cosx')
>> zlabel('time (s)')
```



PLOTTING

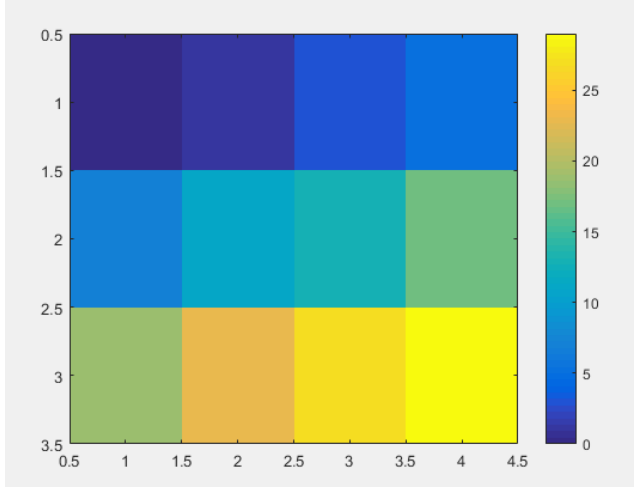
Any matrix can be visualized as an image.

imagesc(C) displays the data in array C as an image that

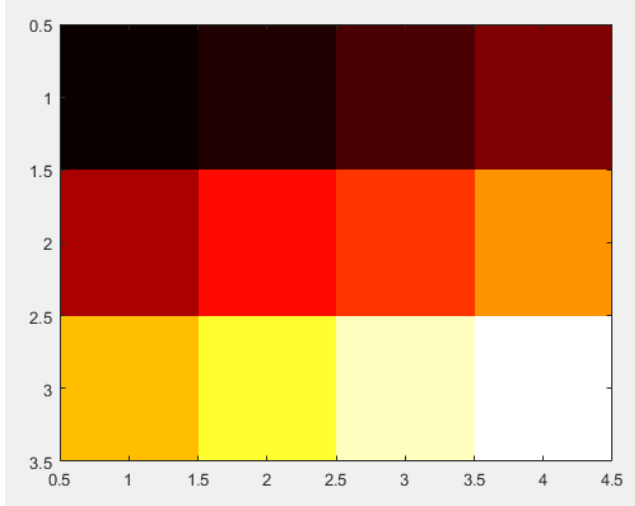
uses the full range of colors in the colormap,

automatically scales values to spread across the entire color map

```
>> C = [0 1 3 5; 7 11 13 17; 19 23 27 29];
>> imagesc(C)
>> colorbar
```




```
>> imagesc(C)
>> colormap(hot)
```



PLOTTING

Surface plots

surf places the values at the points specified in the x, y, z space,

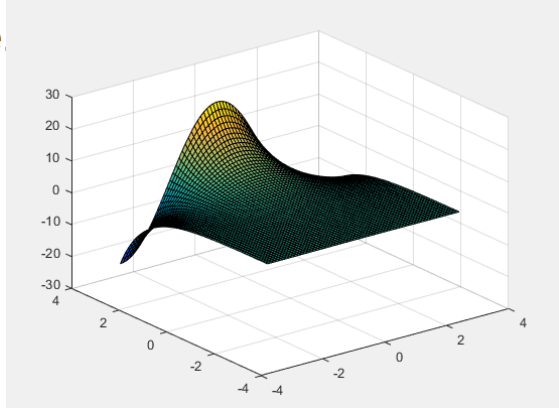
and binds all these values to obtain a surface

Values can be expressed by X, Y, Z matrices

[X,Y] = meshgrid(-pi:0.1:pi);

>> Z = cos(X).*exp(Y)

>> surf(X,Y,Z)



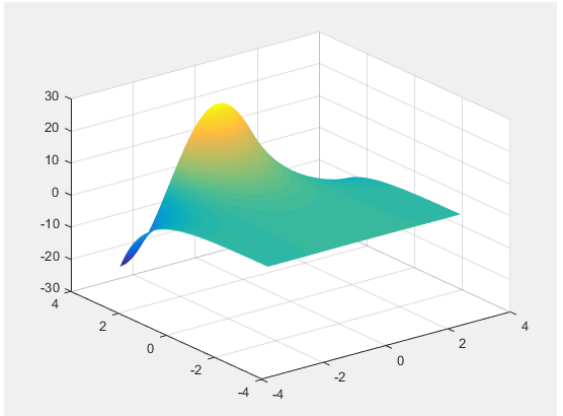
There are three types of surface color shading:

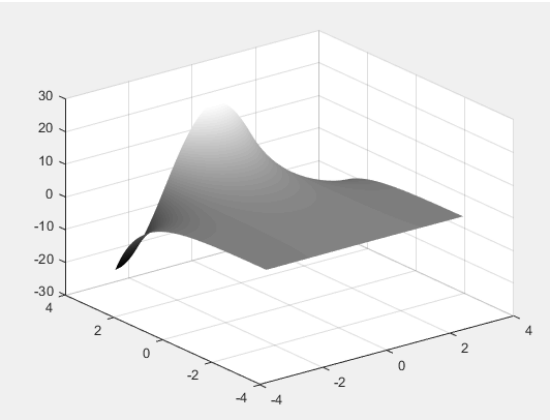
shading flat
shading faceted
shading interp

>> shading interp

You can change color maps

>> colormap(gray)





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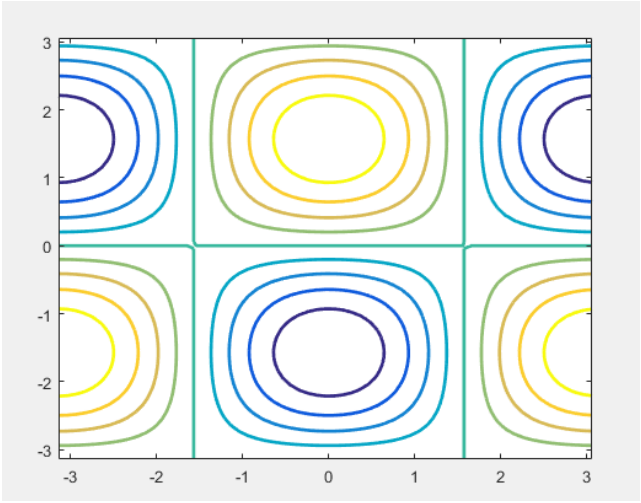
countor(X, Y, Z) : Creates a contour plot.

imagesc(C) displays the data in array C as an image that

uses the full range of colors in the colormap,

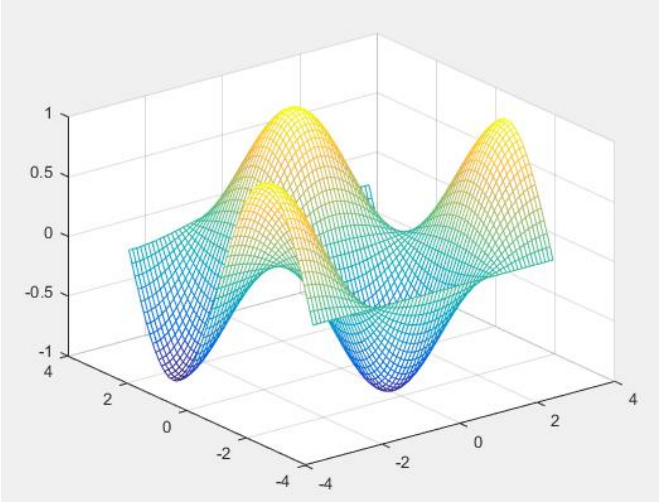
automatically scales values to spread across the entire colormap

```
>> Z = cos(X).*sin(Y);
>> contour(X,Y,Z,'LineWidth',2)
```



mesh(X,Y,Z) : Creates a 3D mesh surface plot

```
>> mesh(X,Y,Z)
```



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3D plotting functions

meshc(X,Y,Z) : draws a wireframe mesh and a contour plot under it with color determined by Z, so color is proportional to surface height

meshz(X,Y,Z) : draws a curtain around the wireframe mesh with color determined by Z, so color is proportional to surface height

surfc(X,Y,Z) : creates a contour plot under the three-dimensional shaded surface

waterfall(X,Y,Z) : creates a waterfall plot using the values specified in X, Y, and Z