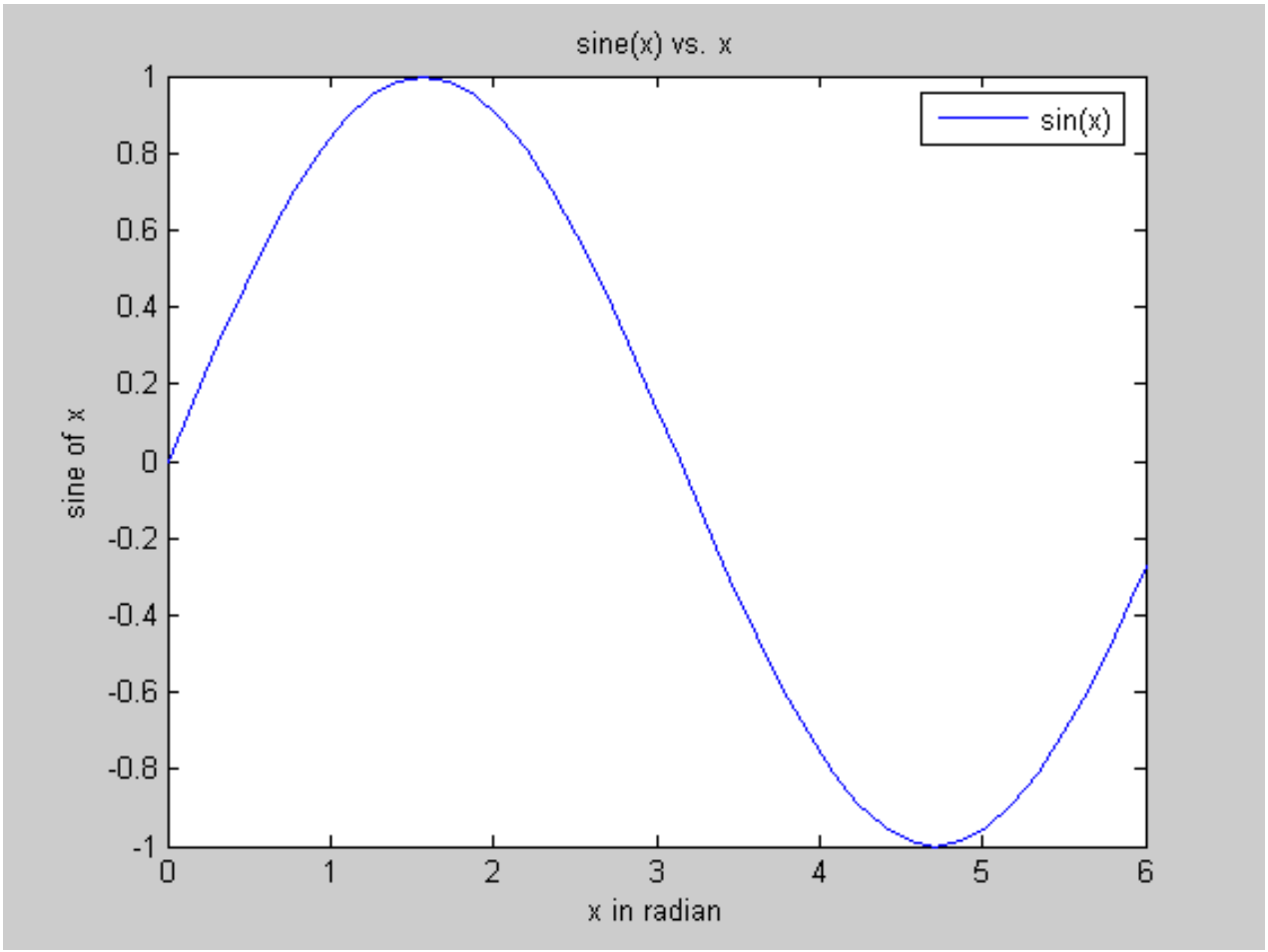
Matlab Lecture 3

Plotting

Basic Plotting

- Define *x* and *y* vectors
  - x = [1:10];
  - y = [10 21 23 43 54 65 76 87 98 78];
  - plot(x,y);
- Include Title, axis labels, grid etc.
  - title('testing'),
  - xlabel('value of x'), ylabel('value of y'),
  - grid on
- Use *axis* command to scale the axis
  - *axis([xmin, xmax, ymin, ymax])*

```
x = 0 : pi/20 : 2*pi;       y = sin(x);
plot(x,y); axis([0 6 -1 1]); title('sine(x) vs. x');
xlabel('x in radian');  ylabel('sine of x'); legend('sin(x)');
```



Useful commands

- *figure*: allows to open a new figure window
  - Example: *figure(2)*
- *pause*: temporarily halt the execution of the program
  - The execution will start when you hit another key
  - *pause(n)*: pause for n seconds before continuing
- *hold on*: use to plot more than one line
  - If you don’t use *hold on*, by default the second plot statement erase the first plot
  - Matlab will continue to plot until it sees *hold off* command.

linspace(X1, X2) generates a row vector of 100 linearly equally spaced points between X1 and X2.

linspace(X1, X2, N) generates N points between X1 and X2.

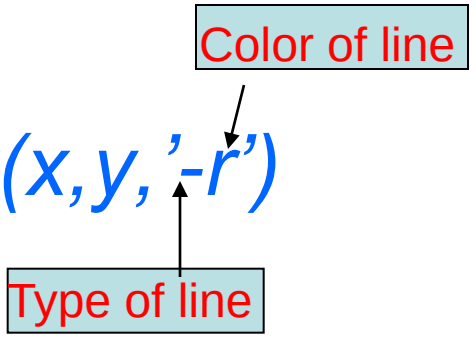
```
x = linspace(1,3,5)
x =

   1.0000    1.5000    2.0000    2.5000    3.0000
```

Plot more than one line

- Use *hold on* command
  - *plot(x, y1); hold on; plot(x, y2); plot(x, y3); hold off;*
- Or use *plot(x, y1, x, y2, x, y3)*
- Or use
  - *z = [y1; y2; y3];*
  - *plot(x, z);*

Line, Color, Mark style

- Use *help plot* command to see what is available
- For one solid red line use *plot(x,y,'-r')*

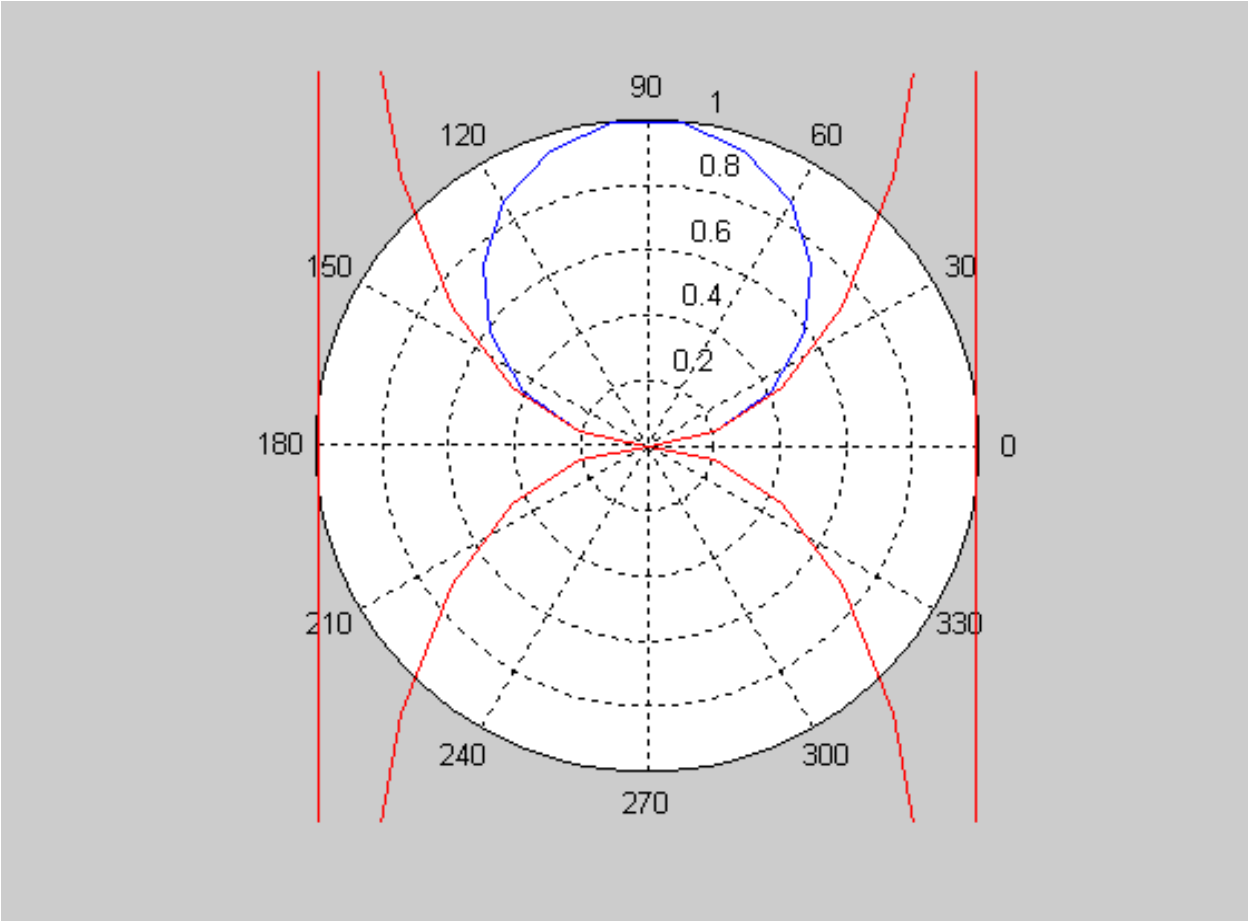


- For multiple lines use
- *plot(x,y,'-*r', x,y2,':+g')*

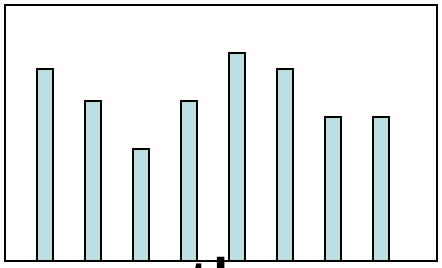
Two Dimensional plotting

- *plot(x,y)* : linear plot of vector x and y
- *semilogx(x,y)* :logarithmic scale of x, linear scale of y
- *semilogy(x,y)*
- *loglog(x,y)* :logarithmic scales for both x, y
- *polar(x, y)* : polar plot of angle x in radians and radial distance y
- *bar(x)* : vertical bar graph of vector x
- *pie(x)* : pie chart of x
- *hist(x)* : histogram

```
x = 0 : pi/15 : 2*pi ;
y = sin(x) ;
y2 = tan(x) ;
polar(x,y) ; hold on ; polar(x,y2, 'r') ;
```



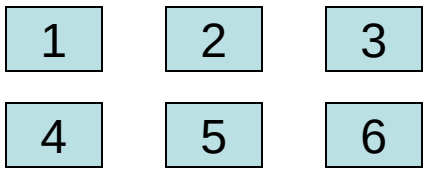
- Histograms:is a plot showing the distribution of a set of variables.
- MatLAB command: *hist(x),* x is a vector containing the data to be used in the histogram.



- To increase the resolution of the histogram: select the number of bins.
- Exp: hist(x,25)

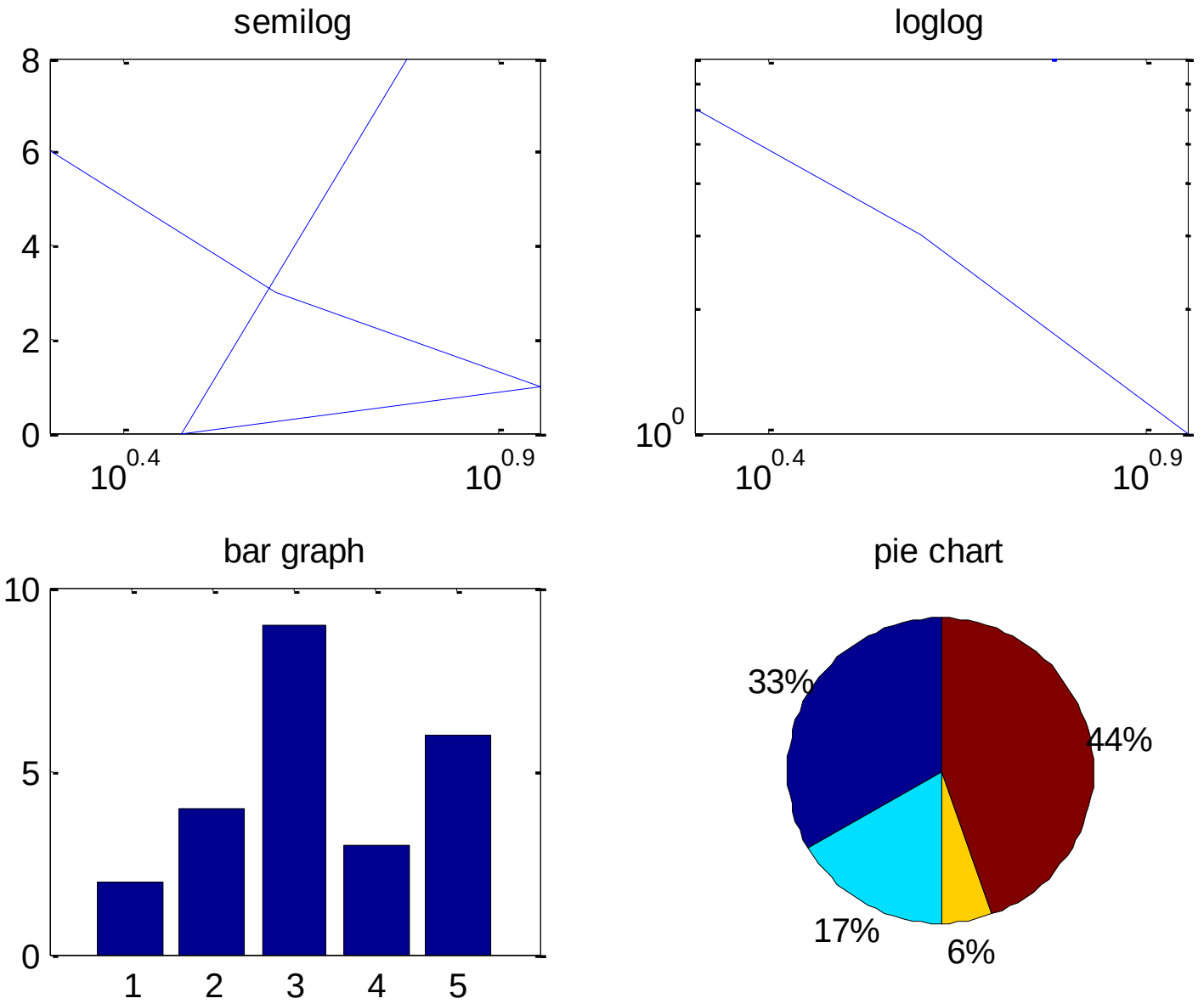
Subplot

- *subplot(m,n,p)*
- *m* and *n* specify that the graph window is to be split into *m* by *n* grid of smaller windows (*m* is the number of rows)
- Digit *p* specify the *p*th window. (*p* < *m***n*)
- The grid windows are numbered from left to right, top to bottom.



subplot(2,3,p)
p is 1 to 6

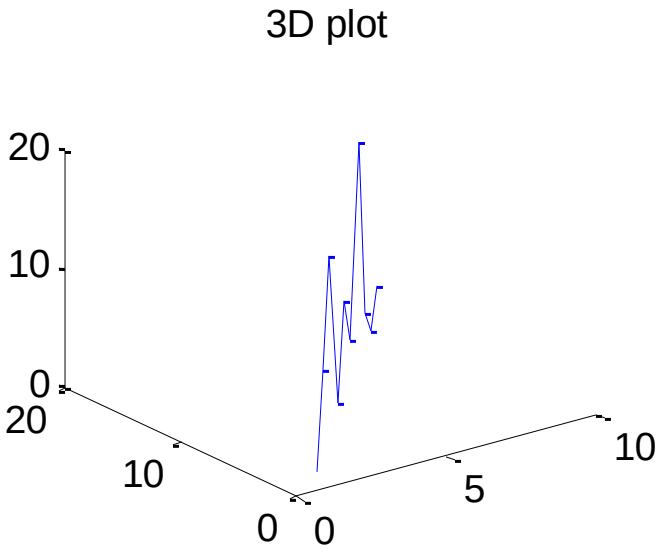
```
    x = [ 2 4 9 3 6];
    y = [ 6 3 1 0 8];

subplot(2,2,1), semilogx(x,y), title('semilog'),
subplot(2,2,2), loglog(x,y), title('loglog'),
subplot(2,2,3), bar(x), title('bar graph'),
subplot(2,2,4), pie(y), title('pie chart'),
```

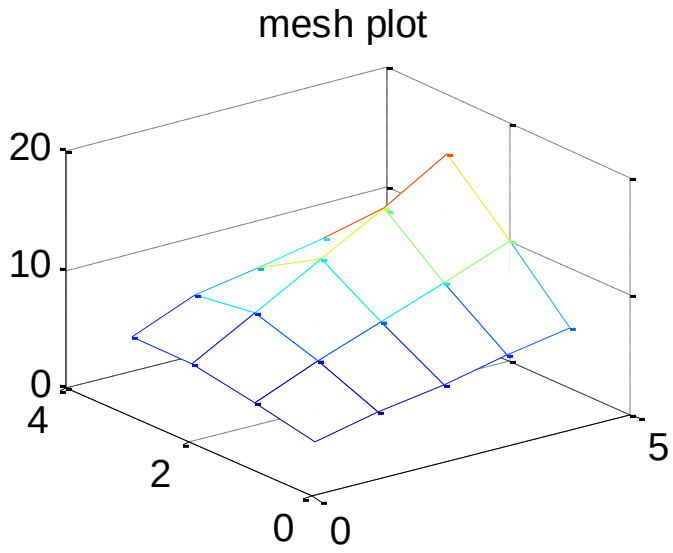

semilog
8
6
4
2
0
10^0.4
10^0.9
loglog
10^0
10^0.4
10^0.9
bar graph
10
5
0
1
2
3
4
5
pie chart
33%
44%
17%
6%

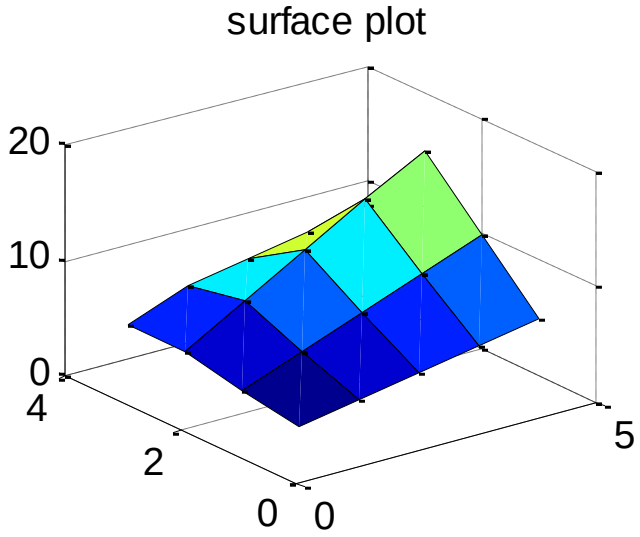
Three Dimensional plotting

- *plot3(x,y,z)* : x, y, z are vectors of same length
- *surf(z), mesh(z)* : plot a surface, z is a two-dimensional matrix; x number of columns and y number of rows
- *contour(function)* :2D representation of a 3D surface
- *bar3(x)* : 3D bar graph

```
x = [ 1:10];
 y = [ 1:2:20];
 z = [1 8 16 2 9 4 19 3 0 2];
subplot(2,2,1), plot3(x,y,z), title('3D plot')

 z = [ 1 2 3 4 5;
       2 4 6 8 10;
       3 6 9 12 15;
       3 5 6 7 8];
  subplot(2,2,2), mesh(z), title('mesh plot')
  subplot(2,2,3), surf(z), title('surface plot')
```


3D plot
20
10
0
20
10
0
0
5
10

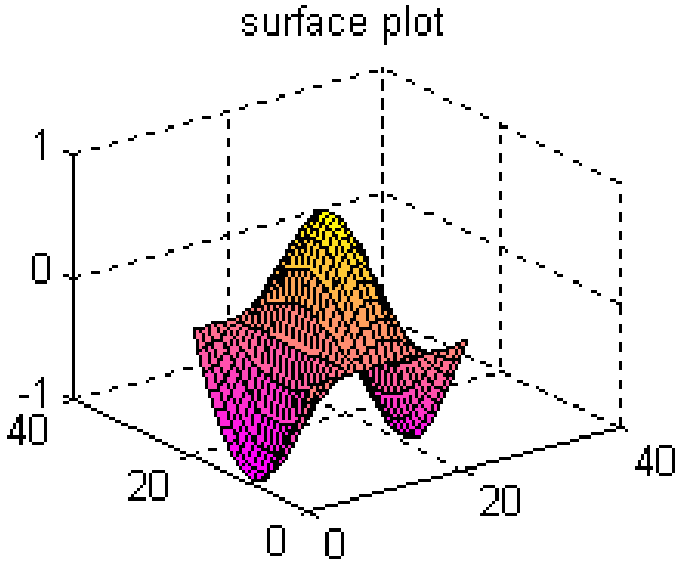

mesh plot
20
10
0
4
2
0
0
5

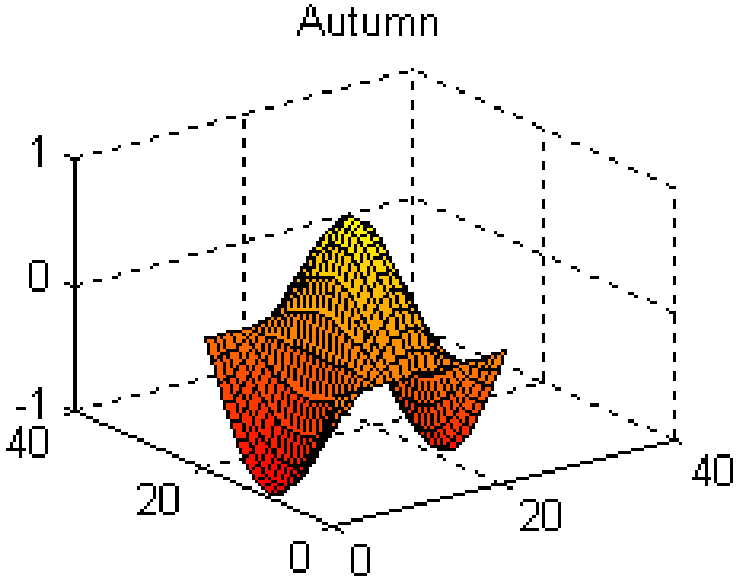

surface plot
20
10
0
4
2
0
0
5

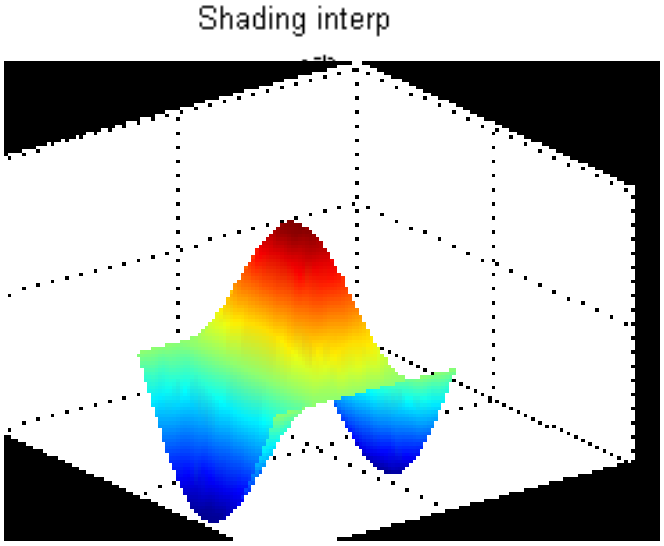
Colored surface

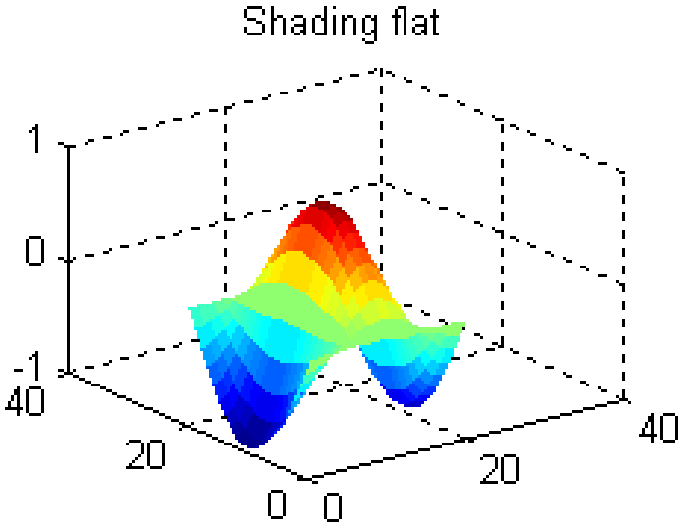
- Use function colormap() for different color scheme
  - use help colormap to see all the schemes
- Use shading scheme with commands like
  - shading interp
  - shading flat

```
subplot(2,2,1), surf(sphere), colormap(spring),title('surface plot')
subplot(2,2,2), surf(sphere), colormap(autumn),title('Autumn')
subplot(2,2,3), surf(sphere), shading interp,title('Shading interp')
subplot(2,2,4), surf(sphere), shading flat,title('Shading flat')
```


surface plot
1
0
-1
40
20
0
0
20
40


Autumn
1
0
-1
40
20
0
0
20
40


Shading interp


Shading flat
1
0
-1
40
20
0
0
20
40

Editing Plots from the menu bar

- Add title, labels, colorbar, legends from *menu→Insert*
- Zoom in or out by using *menu→Tools*
- Change axis properties by clicking *menu→Edit→Axis Properties*
- Want to paste the figure in word document
  - Choose *Edit→Copy Figure*
  - Go to word document and click *paste*
- only disadvantage is as soon as you close the graph window you will loose all the improvements