

10.3 PLOTS WITH SPECIAL GRAPHICS

MATLAB has additional functions for creating various types of special three-dimensional plots. A complete list can be found in the Help Window under Plotting and Data Visualization. Several of these 3-D plots are presented in Table 10-2. The examples in the table do not show all the options available

Table 10-2: Specialized 3-D plots

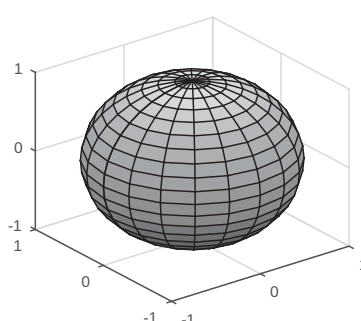
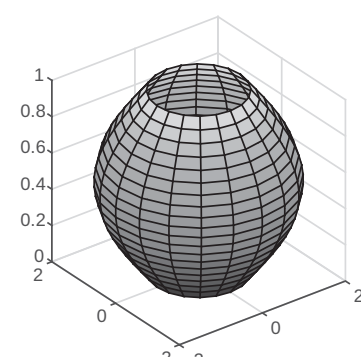
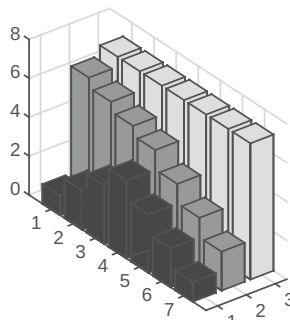
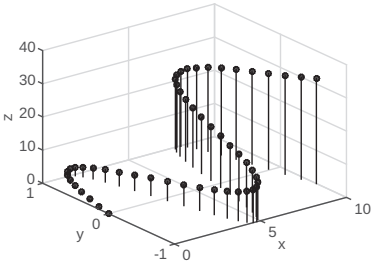
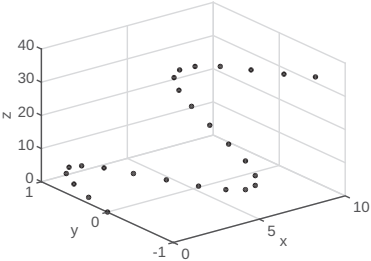
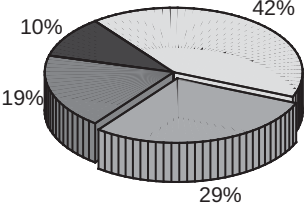
Plot type	Example of plot	Program
<p><u>Plot a Sphere</u></p> <p>Function format: sphere Returns the x, y, and z coordinates of a unit sphere with 20 faces. sphere (n) Same as above with n faces.</p>		<p>sphere</p> <p>or:</p> <pre>[X,Y,Z]=sphere(20); surf(X,Y,Z)</pre>
<p><u>Plot a Cylinder</u></p> <p>Function format: [X, Y, Z]=cylinder(r) Returns the x, y, and z coordinates of cylinder with profile r.</p>		<pre>t=linspace(0,pi,20); r=1+sin(t); [X,Y,Z]=cylinder(r); surf(X,Y,Z) axis square</pre>
<p><u>3-D Bar Plot</u></p> <p>Function format: bar3(Y) Each element in Y is one bar. Columns are grouped together.</p>		<pre>Y=[1 6.5 7; 2 6 7; 3 5.5 7; 4 5 7; 3 4 7; 2 3 7; 1 2 7]; bar3(Y)</pre>

Table 10-2: Specialized 3-D plots (Continued)

Plot type	Example of plot	Program
<u>3-D Stem Plot</u> (draws sequential points with markers and vertical lines from the $x\ y$ plane) Function format: <code>stem3(X,Y,Z)</code>		<pre>t=0:0.2:10; x=t; y=sin(t); z=t.^1.5; stem3(x,y,z,'fill') grid on xlabel('x'); ylabel('y') zlabel('z')</pre>
<u>3-D Scatter Plot</u> Function format: <code>scatter3(X,Y,Z)</code>		<pre>t=0:0.4:10; x=t; y=sin(t); z=t.^1.5; scatter3(x,y,z,'filled') grid on colormap([0.1 0.1 0.1]) xlabel('x'); ylabel('y') zlabel('z')</pre>
<u>3-D Pie Plot</u> Function format: <code>pie3(X,explode)</code>		<pre>X=[5 9 14 20]; explode=[0 0 1 0]; pie3(X,explode)</pre> <div><p><code>explode</code> is a vector (same length as <code>X</code>) of 0's and 1's. 1 offsets the slice from the center.</p></div>

with each plot type. More details on each type of plot can be obtained in the Help Window, or by typing `help command_name` in the Command Window.

Polar coordinates grid in the $x\ y$ plane:

A 3-D plot of a function in which the value of z is given in polar coordinates (for example $z = r\theta$) can be done by following these steps:

- Create a grid of values of θ and r with the `meshgrid` function.
- Calculate the value of z at each point of the grid.