

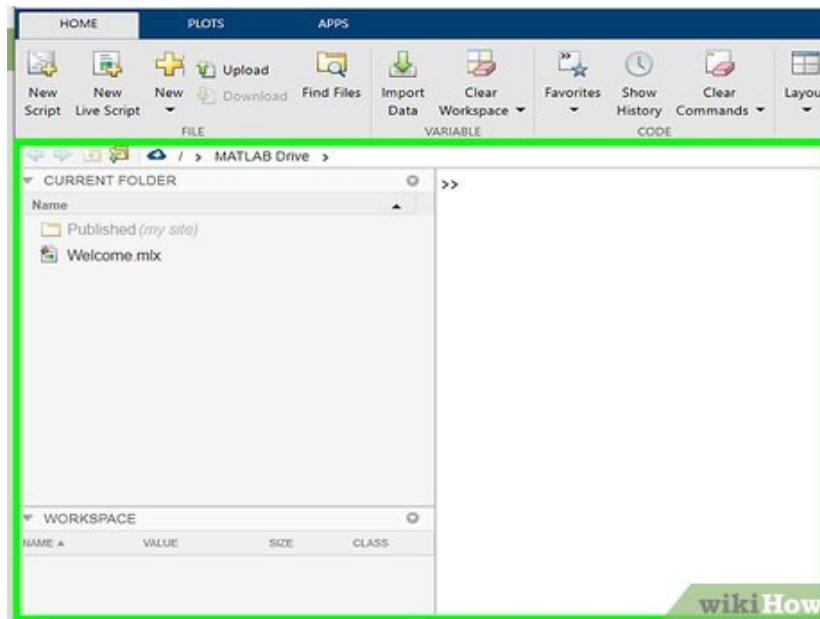
How to Make 3D Plots Using MATLAB

Whether it's for research, a school assignment, or a work presentation, 3-D plots are great for visualizing what a complicated set of data looks like. With the help of MATLAB (Matrix Laboratory), you'll be able to create stunning 3-D...

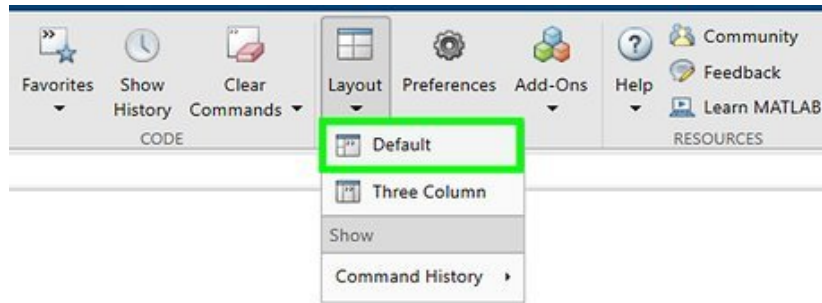
Part 1 of 3:

Constructing the Domain

1.



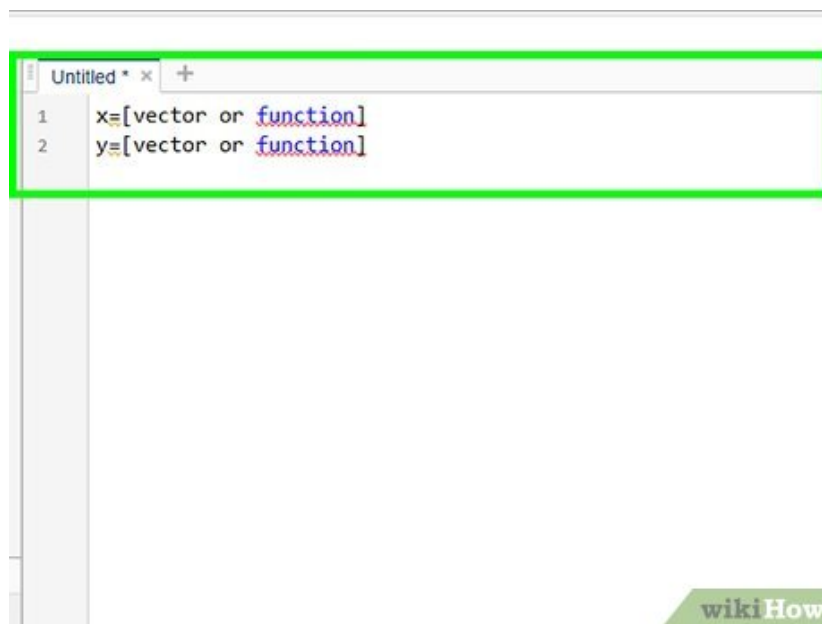
Open the command window. In the default layout this should appear automatically as the biggest window displayed.



2.

wikiHow

If the command window isn't present, select home in the upper left corner. Afterwards, select layout and then "Default".



3.

wikiHow

In the command window, define both of your x and y vectors.

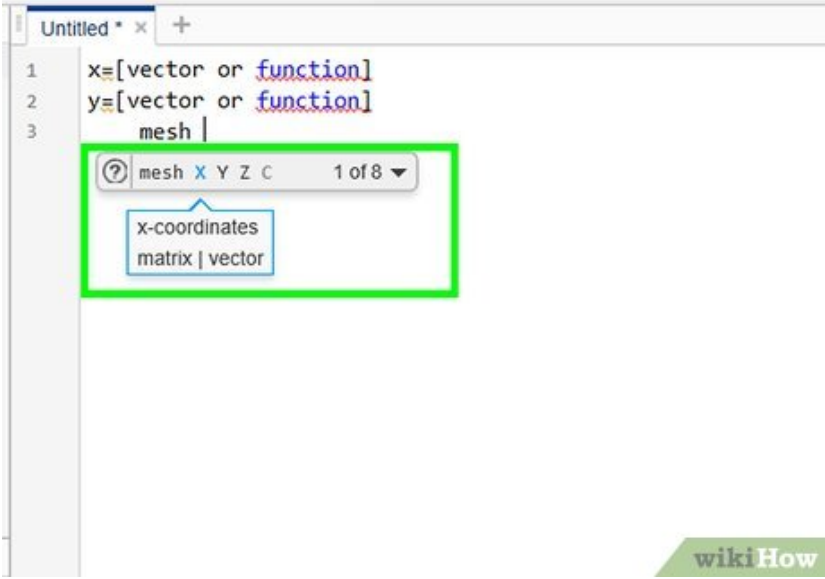
1. This is typically done in the form of $x=[vector\ or\ function]$ and $y=[vector\ or\ function]$
2. Remember to use the dot operator when multiplying or dividing vectors and matrices. Otherwise errors will occur.

Part 2 of 3:

Producing the Grid in the xy-Plane

```
Untitled * x +
1 x=[vector or function]
2 y=[vector or function]
3 mesh |
   mesh X Y Z C 1 of 8
   x-coordinates
   matrix | vector
```

1.

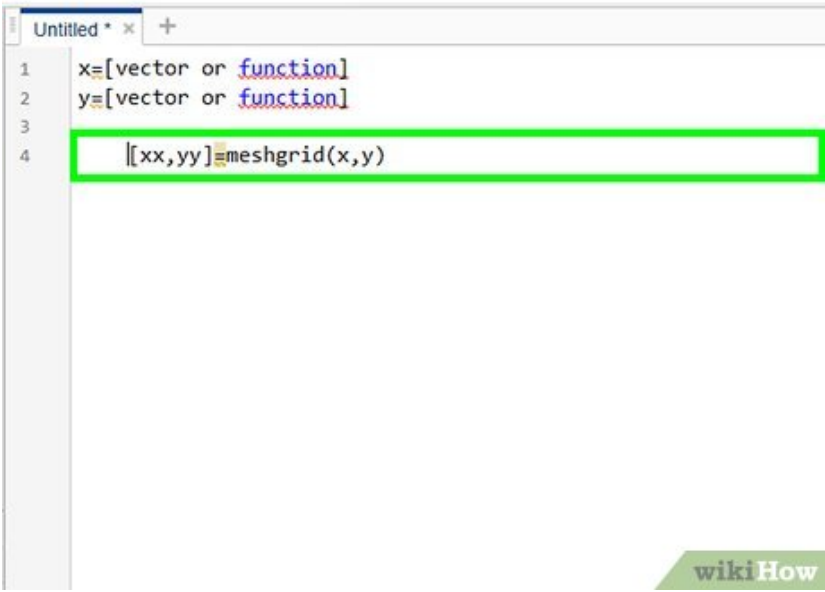


Define a relationship between x and y. In order to accomplish this, two commands must be used.

1. The first is the *mesh* function. By using this, the result will be a wireframe mesh graph.
2. The other is the *surf* function. When using *surf*, the result will be a 3-D surface plot.

```
Untitled * x +
1 x=[vector or function]
2 y=[vector or function]
3
4 [[xx,yy]=meshgrid(x,y)
```

2.



When using mesh, input *meshgrid* to the command window.


1. The command will be formatted as follows: `[[xx,yy]=meshgrid(x,y)`.
2. In the workspace window you will see that the variables *xx* and *yy* have been defined.

Part 3 of 3:

Defining "zz" and Plotting the Surface

```
Untitled * x +
1 x=[vector or function]
2 y=[vector or function]
3
4 [xx,yy]=meshgrid(x,y)
5 zz=xx.^2-yy.^2
6
```

1.




Define zz in terms of xx and yy because of its reliance on those sets of data.

1. Use the relationship you know exists between x and y. This is likely to be a function or formula.
2. e.g., $zz=xx.^2-yy.^2$

```
Untitled * x +
1 x=[vector or function]
2 y=[vector or function]
3
4 [xx,yy]=meshgrid(x,y)
5 zz=xx.^2-yy.^2
6 surf(xx,yy,zz)
7 |
```

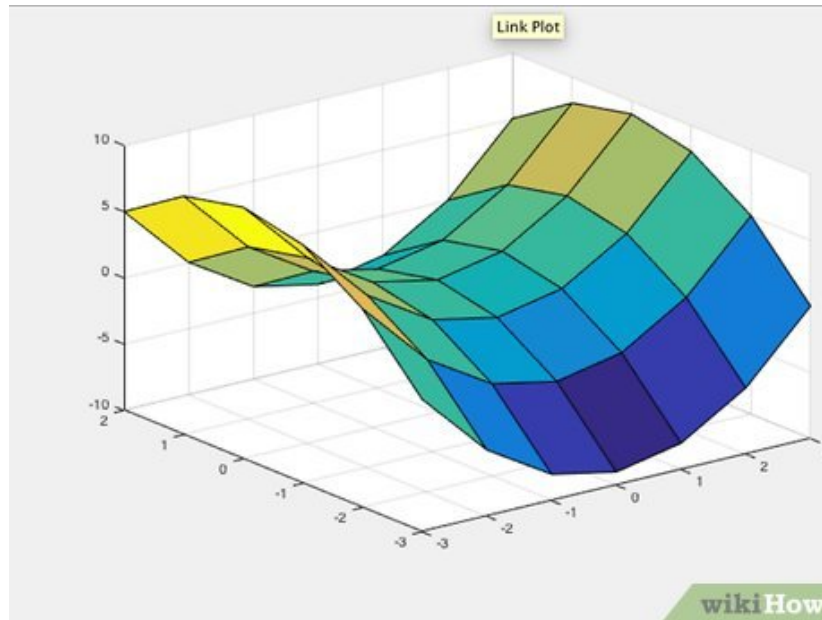
2.



Plot the surface using the *surf* command.

1. From the z components in the matrix "zz", the surf command will create a 3-D shaded surface.
2. This is the point in which you will relate **xx**, **yy**, and **zz** together.
3. The actual command line will be in the format of **surf(xx,yy,zz)** .

3.



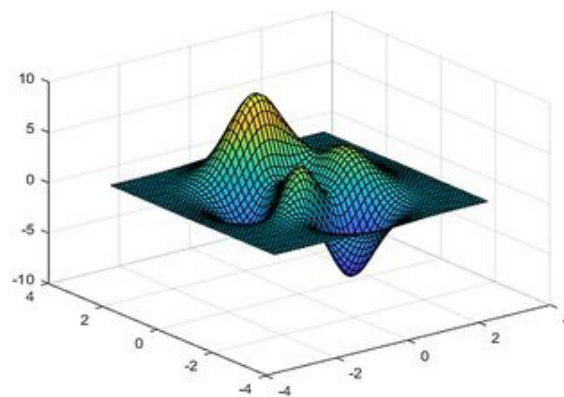
Watch for your new window to appear showing your 3-D plot.

Surface Objects

There are several ways to create a surface object in MATLAB. One way is to use surf.

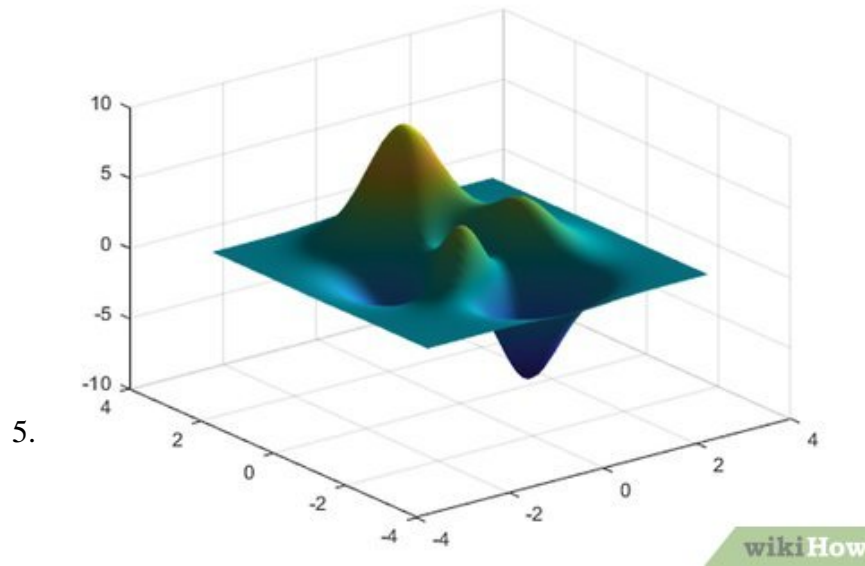
```
[X,Y,Z] = peaks(50);  
figure  
surf(X,Y,Z)
```

4.



Customize as you'd like. There is a toolbar at the top of the window where the new plot has appeared. This toolbar contains many options and features that can be used to manipulate your 3-D plot.

1. Some of these options include:
 1. Inserting a label for the x, y, or z axis
 2. Inserting a legend to help readers
 3. Rotating the plot in it's 3-D space
 4. Inserting a light source to show the effects of shadows
2. A list of complex surface properties can be found at <http://www.mathworks.com/help/matlab/examples/changing-surface-properties.html>



Smooth the color map across the entire surface of the graph, if you'd like. This is done by using the command line *shading interp*.

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