

Very brief introduction to Matlab – UH Dept. of Geology and Geophysics

This is for first time users. Before you start, you need an account with the department, a login name and password (this comes when you get your account), and a code to get into the computer room.

- 1 Start a computer. Many of the computers are on but are sleeping. To wake a sleeping computer, press the cursor arrow keys. If the computer is off, turn it on by pressing the power button on the front of the computer.
- 2 Log in.
- 3 Click on the Matlab icon. It takes a while for Matlab to open up.
- 4 On the menu bar, note “File”, “Edit”, “View,” and “Help”.
Click on these titles to see what options you have. In particular, click on Help -> Matlab Help. This gets you to Matlab’s help website. This site contains an enormous amount of useful information, and many examples of how to use Matlab. The Matlab Roadmap window has a link to alphabetical listings of the Matlab functions that is especially helpful. For example, if you click on this link and go to the function ‘sph2cart’, you will find a description of how to convert from spherical coordinates to Cartesian coordinates. Note that this example has illustrations that help in understanding what ‘sph2cart’ does. At the bottom of the ‘sph2cart’ window are links to related functions; most Matlab functions have analogous links. Get familiar quick with the function ‘plot’ via Matlab Help.
- 5 Click on View -> Desktop Layout -> Five Panel
This will give you a 5-window display for Matlab. The titles of the windows are:

Launch Pad (upper left) Workspace (upper central) Command Window (right)

Command History (lower left) Current Directory (lower central)
- 6 Go to the Current Directory window. You will need to set up a directory (or folder) to contain files you write or use in this class. In the Current Directory subwindow, type
C:\
Then click on the ‘bambam’ icon. You will then see that you have an option to create a folder. Do so, and name the folder GG303. From now on, navigate to the GG303 folder when you do Matlab work in this class. You can do this quickly by clicking and holding the mouse button on the black downward-pointing triangle next to the short wide box identified as “Current Directory”. On some versions of Matlab two of these boxes are shown (one being at the top of the entire Matlab window).
- 7 In the Launch Pad window, if you click (or double click) on the MATLAB icon, you will see a “Demos” icon appear (among others). Clicking on the “Demos” icon will open up a window with many Matlab demonstrations. Clicking backing on the MATLAB icon in the Launch pad will close folders back up in the Launch Pad window.
- 7 The Workspace shows you which, if any, variables have assigned values. When you start up Matlab, this will be empty.
- 8 The Command History window list commands you have used.
- 9 The Current Directory window shows the files and folders in the directory you are in.
- 10 The Command Window is where you type commands for Matlab.

Example: sph2cart, a command for converting spherical coordinates to Cartesian coordinates.

Type the following commands in the Command Window, and hit “Return” at the end of each command. As you do this, note that the contents of the Command History window and Workspace Window change.

```
>> help sph2cart  
>> help plot  
>> help deg2rad  
>> help rad2deg
```

These commands give you some help for how to run Matlab functions, but note that they don't have the graphics that Help -> Matlab Help does.

Continue typing to find the Cartesian coordinates of a unit vector with a trend of 30 degrees and a plunge of 60 degrees. In the lines below I've made comments on the right – don't type them!

```
>> [x,y,z] = sph2cart(THETA,PHI,R)      (Matlab returns an error message)  
>> THETA = 30                          (Matlab returns the value of THETA)  
>> THETA = 30;                          (The semicolon suppresses printing)  
>> q = [1 2 3]                          (Variables can be arrays of numbers)  
>> [x,y,z] = sph2cart(THETA,PHI,R)      (Matlab returns a new error message)  
>> PHI = 60  
>> R = 1                                (Our vector here is of unit length)  
>> [x,y,z] = sph2cart(THETA,PHI,R)      (Does the answer make sense? Why?)
```

The answer does not make sense, because Matlab assumes the angles are in radians, not degrees. Most mathematics packages assume the angles are in degrees, including Matlab and Excel. To see this type

```
>> help cart2sph
```

and read what returns. Now we need to convert the angles from degrees to radians. So type

```
>> help deg2rad                          (deg2rad is a very valuable function)  
>> THETAR = deg2rad(THETA)               (Gives THETA in radians)  
>> PHIR = deg2rad(PHI)                   (Gives PHI in radians)  
>> [x,y,z] = sph2cart(THETAR,PHIR,R)     (Are these right?)
```

Lets take the values of x,y,z and see if we can get THETA and PHI back

```
>> [theta,phi] = cart2sph(x,y,z)          (Not what we wanted; need answer in °)  
>> thetad = rad2deg(theta)                (Looks good)  
>> phid = rad2deg(phi)                    (Looks good)  
>> d = sqrt(x.*x + y.*y + z.*z)           (This is another check. Do you get 1?)
```