

ME 2040 – Numerical methods  
MATLAB - Getting Started  
Spring 2002

The purpose of this handout is to provide elementary information to help students get started using MATLAB. Most of the information found on this sheet is from MATLAB manuals or their web page. Other basic information on getting started with MATLAB can be found in your textbook in Appendix B.

Before going very far we must introduce the concept of the “Command line.” It is located in MATLAB’s “Command Window” and is indicated by two consecutive “greater than” signs, ie: `>>` . This is the location where MATLAB commands can be interactively entered.

MATLAB Help resources:

1. Command line help can be obtained by typing: `help command`  
example:  
`>> help if`  
produces help on the if statement.
2. Mathworks home page: <http://www.mathworks.com/products/matlab/>
3. demo command – by typing `demo` at the command line you run several demonstrations that show you how to use specific features in MATLAB.
4. Mark S. Gockenbach MATLAB introduction web page:  
<http://www.math.mtu.edu/~msgocken/intro/intro.html>

Important expressions and operators:

+	Addition		
-	Subtraction		
*	Multiplication		
/	Division		
^	Power		
( )	Specify evaluation order		
pi	3.14159 ...	log	Natural logarithm
exp	exponential	log10	log base 10
		log2	log base 2

Example:

```
>> x = (pi*log(y)+exp(x/z))^2;
```

Note that if the semicolon at the end of the line is omitted, the variable and its value will be echoed to the screen.

### Writing ASCII data to a file:

An array of data can be written to a file using the following set of commands:

```
fid=fopen('filename.dat','w');
for i=1:nx
fprintf(fid,'%7.3f \t %7.3f \n',x(i),y(i));
end
fclose(fid);
```

In the above code, the `fopen` statement opens a file named `filename.dat` for writing (as indicated by the `'w'` statement). In this example, the *for loop* is used to write two columns of data from the arrays `x` and `y` to the file using the `fprintf` command which requires a file id and specific formatting information. The formatting is similar to C formatting where the `%7.3f` indicates that the array `x` should a floating point type with a total of seven characters, three to the right of the decimal place. The `\t` indicates a tab in the field and `\n` indicates the end of line.

### Loading ASCII data into MATLAB:

The `load` command can be used to import ASCII data into MATLAB as follows:

```
>> load sphere_vel.dat
```

MATLAB automatically creates a matrix called `sphere_vel` containing the data from the original file `sphere_vel.dat`. If the loaded matrix consists of the data saved above (See Writing ASCII data to a file) using the `fprintf` command, then individual variables can be extracted as follows:

```
data range      Column number
>> x = sphere_vel(3:34,1);
>> y = sphere_vel(:,2);
```

The first line of code effectively says, take the data in column 1 from rows 3 to 34 and place it into array named `x` of length of 32. Much of the time you would simply like to place all of the data from a particular column in an array by itself. The second line of code does this simply by placing the colon with no range defined.

### M-files

Files that contain code in the MATLAB language are called M-files. You create M-files using a text editor, then use them as you would any other MATLAB function or command. For example to create the m-file `newcode.m` you can use the MATLAB editor by typing:

```
>> edit newcode.m
```

Next, add the code you would like to have executed and save the file. At the command prompt type: `>> newcode` and the code will be executed (Remember not to include the `.m` when executing an m-file).

There are two kinds of M-files:

1. **Scripts:** which do not accept input arguments or return output arguments. They operate on data in the workspace.
2. **Functions:** which can accept input arguments and return output arguments. Internal variables are local to the function.

If you're a new MATLAB programmer, just create the M-files that you want to try out in the current directory. As you develop more of your own M-files, you will want to organize them into other directories and personal toolboxes that you can add to MATLAB's search path.

If you duplicate function names, MATLAB executes the one that occurs first in the search path.

To view the contents of an M-file, for example, `myfunction.m`, use

```
type myfunction
```

### Flow Control

MATLAB has several flow control constructs:

```
if statements  
switch statements  
for loops  
while loops  
continue statements  
break statements
```

More information on each of these statements can be found in MATLAB's on-line help.