

Lab 01: Introduction to MATLAB

Math 3341: Introduction to Scientific Computing Lab

Spring 2018

In this lab you will learn the basics of Matlab. You will see how to perform basic mathematical calculations as well as how to easily record input and output during a MATLAB session.

A few things to note:

- MATLAB will be abbreviated as ML in most lab documents.
- Text that appears with the following format: `matlab` font indicates the use of ML commands and syntax.
- The symbols `<` `>` and any text you may see in between indicates a placeholder for an input. Usually the text will indicate the type of input. For example, `clear <varName>` would mean using the `clear` command for some variable.

Functions and Commands Used

The following is a list of commands used in this lab along with a brief description of what they do.

Table 1

| Command | Description |
|--------------------------------------|--|
| <code>clc</code> | clears the command window (does not clear variables) |
| <code>beep off</code> | turns off noise produced by error messages |
| <code>diary('fileName.txt')</code> | creates a record of command window input/output |
| <code>help <searchTerm></code> | searches the ML documentation and outputs information to the command window. |

Using the Matlab Documentation

The `help` command is good for quick searches regarding function input, function options, or other ML related information. For more detailed documentation with examples, use the search bar in the upper right hand of the ML application window. The ML documentation is also available online.

Basic Math Operations

Infix Notation

Infix notation is the notation commonly used in arithmetical and logical formulae and statements. It is characterized by the placement of operators between operands “in-fixed operators” such as the plus sign in $2 + 2$.

Table 2

| Infix Notation | Functional Notation |
|----------------|---------------------------|
| <code>+</code> | <code>plus(a,b)</code> |
| <code>-</code> | <code>minus(a,b)</code> |
| <code>*</code> | <code>times(a,b)</code> |
| <code>/</code> | <code>rdivide(a,b)</code> |
| <code>^</code> | <code>power(a,b)</code> |

Functional notation

Functional notation is useful for operations that we cannot type. Usually we also think about these as functions and may write them as such in mathematical notation as well, hence the name; but notice that in mathematics notation some may be represented by symbols, like the square root symbol, that does not appear on the keyboard.

Recording Matlab Input and Output

The `diary` function creates a log of keyboard input and the resulting text output, with some exceptions (see ML documentation). The output of `diary` is an ASCII file, suitable for searching in, printing, inclusion in most reports and other documents. To create a diary use the syntax

```
diary('filename.txt')
```

All input and output to the command window will then be recorded in this file until you state the command `diary off`.

If you want to start recording again call either `diary on` or `diary('filename.txt')` and any new input or output will be appended to this file.

A few things to note

- It will be important to state `.txt` at the end of your filename or you may have difficulty incorporating it into a report file or uploading it to WyoCourses.
- Do not try to view the file while recording. It will not show the proper input/output. The file can be viewed after calling `diary off`.
- If you do not specify filename, the ML creates a file named “diary” in the current folder.
- If you have several different diaries, `diary on` uses the most recent diary file. To determine the current diary call `get(0, 'DiaryFile')`.
- To incorporate files properly in LaTeX documents you will need to delete any error messages that were printed to the command window. Otherwise, you will have issues compiling your pdf.

It is recommended that you start a diary any time you open ML to do work. This will serve as a record of what you were doing in a given session.

Matlab Live Editor

The basics of performing calculations in Matlab are demonstrated in `lab01.mlx`. This is what is known as a Live Script. Essentially, this type of file allows for text mixed with code blocks that can be executed just by clicking on left side of each code block. This format is similar to a Mathematica or Jupyter notebook if you have seen either of those before.

Explore this document to see how the basic syntax in Matlab works. After you have seen the way in which Matlab performs basic calculations, proceed with the Lab Exercises on the next page.

Lab Exercises

In this assignment you will practice using the command window to carry out basic calculations, learn how to use the help function, MATLAB (ML) documentation, and record your input and output using the `diary` function.

1. In the command window enter the command `diary('lab01.txt')` this will create a `.txt` file. This will record all input and output in the command window until you type the command `diary off`.
2. Type the command `beep off`. This will disable the sound that plays when there is an error in your code.
3. Use the `help <fcn name>` to search for the relevant function in the problems below. Consider your 'answer' to this question to be the output generated by the `help` command.
 - (a) What type of logarithm does the `log(x)` function calculate?
 - (b) Does the ML default setting calculate trigonometric functions in radians or degrees?
4. Carry out the following calculations using normal math operators:
 - (a) $2 + 5$
 - (b) 4^5
 - (c) $7 \cdot 6$
 - (d) $3/8$
 - (e) $54460 - 2342$
 - (f) $\cos(50^\circ)$
 - (g) $\sqrt{4}$
 - (h) $\ln(3)$
 - (i) $\sin\left(\frac{\pi}{2}\right)$
 - (j) e^{34}
5. For problems (a) - (e) you must also carry out each calculation using functional notation for each operation. Use a the `help` command and/or search the ML documentation to find what the functional notation is for each operation.
6. When you complete the above tasks enter the command `diary off`. This will stop recording the input and output in the command window.