

Computing for Math and Statistics

Intro

Matlab

- Numerical computing environment
- Programming language
- Proprietary system
- Extensible
- Easy to start using
- Main strength: Linear Algebra (matrices), numerical analysis

Matlab

- Can be used as calculator
- Or as a calculator on hormones
- Can be used to quickly try a couple of ideas
- Can be used to write a few simple programs
- Can be used to develop industrial strength software

As a calculator

- Fire up matlab and type
 - `1+1`
- Or type
 - `sind(90)`
 - `cos(0)`
 - `tan(pi/4)`

As a calculator

- Built-in functions
 - sin, cos, etc, sind, cosd, etc
 - sqrt, exp, nthroot
 - floor, ceil, rem, sign
- Built-in commands
 - clc (clear command window)
 - clear (clear all variables)
 - who (list all variables)
 - whos (list them with size)

Simple Programming

- Simple programming, usually means a set of simple calculations, without conditional statements, loops, function calls, etc
- We need three more concepts:
 - Variables
 - Assignment operators (aka assignments)
 - Script files (aka scripts)

Variables

- A variable is a place in the computer memory
- It has a name
 - A combination of letters and digits (has to start with a letter)
- Can be defined by the user
 - In matlab we define a new variable just by using it.
- There are variables defined by the system (predefined)
 - Can be redefined, but it is a lousy idea
- A simple program can have dozens of them
 - One has to be careful about having too many.
 - It is better if they have easy to remember names.

Variables

- Variable names
 - Start with a letter
 - Can have many letters, digits, underscores
 - No dots, commas, spaces, etc
 - Up to 63 characters long
 - Case sensitive
- Good idea for names to be
 - Short, but descriptive
 - Different from built-in variables

Assignments

- When we execute an assignment we save the value of a calculation in this place in the computer memory
- It is represented by the symbol =
 - Other languages use :=
- The command
 - $X=1+1$
- Stores 2 in a place in memory named X
- We read “*X becomes one plus one*”
 - **Not** X equals one plus one.

Built in Variables

- There many predefined variables that are useful
 - ans
 - pi
 - eps
 - inf
 - i or j
 - NaN

Keywords

- There are many keywords which are essential for the operation of Matlab and cannot be used as variables
 - break, case, catch, continue, else, elseif, and, for, function, global, otherwise, return, switch, while

Script Files

- Script files (scripts for short) are files on the hard disk or on a USB stick.
- They contain matlab commands
- If we run (execute) the script it is as if we just typed the commands in the script file into the command window.
- We can execute a script by clicking the play button (if the file is currently in the editor)
- We can also execute it by typing its name.

Script Files

- Script files can be created in the matlab editor, or any other editor
- Can be executed many times
- Very useful for testing and debugging
- We usually write simple programs in script files.
- For complex projects we use function files.
 - For this you got to wait a few weeks.

Current Folder

- Also current working directory
- It is displayed above the command window or the editor
- Can be changed with the mouse
- Or with commands like `cd`
- There is also the concept of the path
 - The list of directories that Matlab will search to find a command that the user issued
 - Most of the times you do not need to worry about it.