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 definition, 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
- Other than the first one, other languages call them constants

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, end, 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.