

Notes on MATLAB
 Math 130 Linear Algebra
 D Joyce, Fall 2015

What is MATLAB? It's an interactive system for doing mathematics. It can perform tasks that you could do by hand, but it won't make the mistakes we make and it works much faster. You can ask it to do simple things like solve algebraic equations, to higher mathematics involving derivatives and integrals, to complicated things like run simulations. It works with numbers, matrices, symbolic expressions like $x^2 - \sin x$. You can ask it to produce 2- and 3-dimensional graphs, and graphs that change with time.

It's used in mathematics, statistics, physics, economics, management, and other natural and social sciences.

There are other programs like this you may have heard of including Maple, Octave, Mathematica, or Mathcad, Magma, and SciLab. They can all do the same basic things, and when you learn one of them, you know what to expect of the others. They differ in how you interact with the program, their price, and what advanced things they can do.

MATLAB is produced by MathWorks. See their home page at <http://www.mathworks.com/>. On their website they've got some on-line books you might look at. In particular, there's Cleve Moler's books *Numerical Computing with MATLAB* and *Experiments with MATLAB*. You can also try out MathWorks' MATLAB Tutorial.

Where can you run MATLAB? It's available on campus Windows machines in several places including these

- Math/Computer Science Lab, room 310. It's the lab near the elevator half way between the second and third floor.
- Academic Commons Plaza Level Computer Lab (Room 107D)
- Goddard Library 2nd, 3rd, and 5th Floor Computers

Log in on a computer with your username and password. You'll find MATLAB in the All-programs menu.

Getting started with MATLAB. Below is a short MATLAB session to solve the following system of linear equations.

$$\begin{cases} 2x - 3y + 4z = -12 \\ x - 2y + z = -5 \\ 3x + y + 2z = 1 \end{cases}$$

In the session, a matrix **A** is created that holds the coefficients, and a column vector **b** holds the constants. The solution is computed with the instruction $\mathbf{x} = \mathbf{A} \backslash \mathbf{b}$ which says the solution is $(x, y, z) = (1, 2, -2)$.

```
$ matlab
      < M A T L A B >
Copyright 1984-2007 The MathWorks, Inc.
Version 7.5.0.338 (R2007b)
August 9, 2007
```

```
>> A = [2 -3 4; 1 -2 1; 3 1 2]
```

```
A =
     2     -3     4
     1     -2     1
     3     1     2
```

```
>> b = [-12; -5; 1]
```

```
b =
    -12
     -5
      1
```

```
>> x = A\b
```

```
x =
    1.0000
    2.0000
   -2.0000
```

```
>> exit
$
```

Math 130 Home Page at <http://math.clarku.edu/~ma130/>