1 Introduction

MATLAB is an interactive system and programming language for general scientific and technical computation. The first version of MATLAB, written at the University of New Mexico and Stanford University in the late 1970's, was intended for use in courses in matrix theory, linear algebra, and numerical analysis. However, MATLAB is currently being used as the primary scientific tool in every conceivable area of Engineering and Mathematics.

The basic data element in MATLAB is a matrix that does not require dimensioning. This allows solution of many numeric problems in a fraction of the time it would take to write a program in a language such as FORTRAN, Basic, or C. Furthermore, problem solutions are expressed in MATLAB almost exactly as they are written mathematically.

Mathematics is the common language of much of science and engineering. Matrices, differential equations, arrays of data, plots, and graphs are the basic building blocks of both applied mathematics and MATLAB. It is the underlying mathematical base that makes MATLAB accessible and powerful. MATLAB has been used in many different fields. For instance,

- A physics grad student analyzing and visualizing data from her experiments with magnetic fields of superconductors.

- An intenationally known amusement park modeling the control systems for its water rides.

- A large food company analyzing how microwave ovens cook pizzas.

- A cable television company investigating encoding and compression schemes for digital TV.

- A sports equipment manufacturer modeling golf-swings.

- A third grader learning her multiplication tables.

In all these cases, and thousands more, MATLAB's mathematical foundation made it useful in places and applications far beyond those that one can contemplate.

Perhaps the easiest way to visualize MATLAB is to think of it as a full-featured calculator. Like a basic calculator, it does simple math such as addition, subtraction, multiplication, and division. Like a scientific calculator, it handles complex numbers, square roots and powers, logarithms, and trigonometric operations such as sine, cosine, and tangent. Like a programmable calculator, you can store and retrieve data; you can create, execute and save sequences of commands to automate the computation of important equations; you can make logical comparisons and control the order in which commands are executed. Like the most powerful calculators available, it allows you to plot data in a wide variety of ways, perform matrix algebra, manipulate polynomials, integrate functions, manipulate equations

symbolically, etc.

In reality, MATLAB offers many more features and is more multifaceted than any calculator. MATLAB is a tool for making mathematical calculations. MATLAB is a user-friendly programming language with features more advanced and much easier to use than computer languages such as BASIC, Pascal, or C. MATLAB provides a rich environment for data visualization through its powerful graphics capabilities. MATLAB is an application development platform, where sets of intelligent problem-solving tools for specific application areas, often called *Toolboxes*, can be developed with relative ease.

Because of the vast power of MATLAB, it is important to start with the basics. That is, rather than throw everything at you and hope that you understand some of it, in the beginning it is helpful to think of MATLAB as a calculator. First as a basic calculator. Next as a scientific calculator. Then as a programmable calcultor. And finally as a top-of-the-line calculator. By using this calculator analogy, you will see the ease with which MATLAB solves everyday problems, and begin to see how MATLAB can be used to solve complex problems in a flexible, straightforward manner.

Depending on your background, you may find parts of this course boring or some of it may be over your head. In either case, I will try to find a point in the course where you're comfortable, start up MATLAB, and begin.

Good Luck

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