MATLAB for the Sciences

An Introduction to MATLAB

Jon M. Ernstberger

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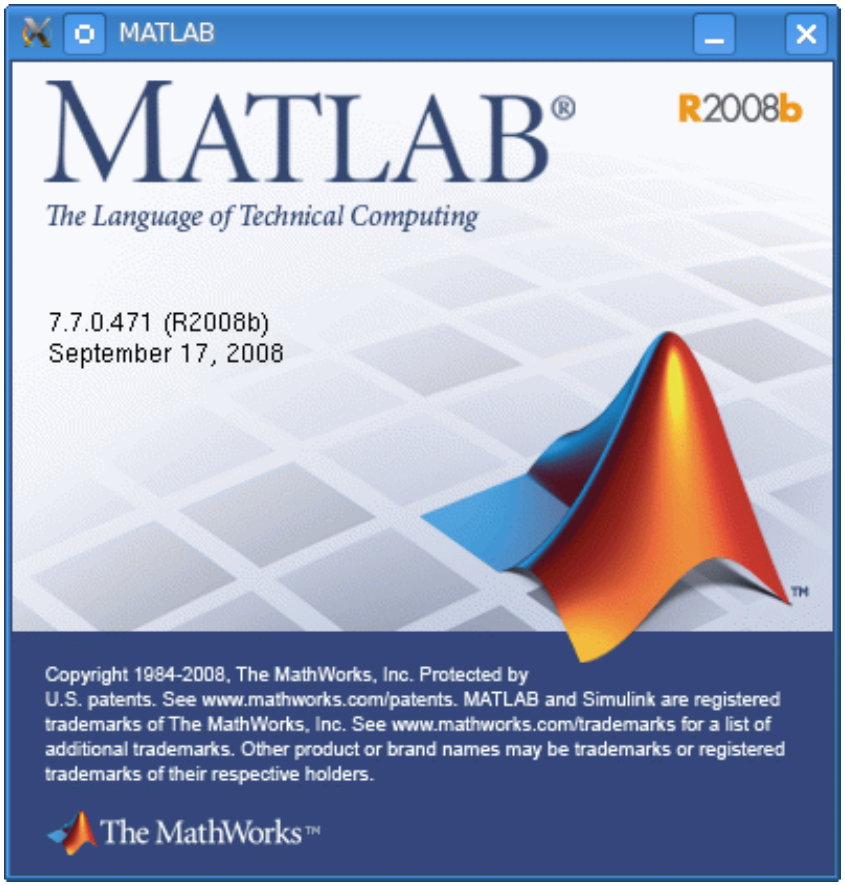
Introduction

- What is MATLAB?
- Where does it come from?
- What does MATLAB mean?
- Why is it useful?
- Who makes MATLAB?



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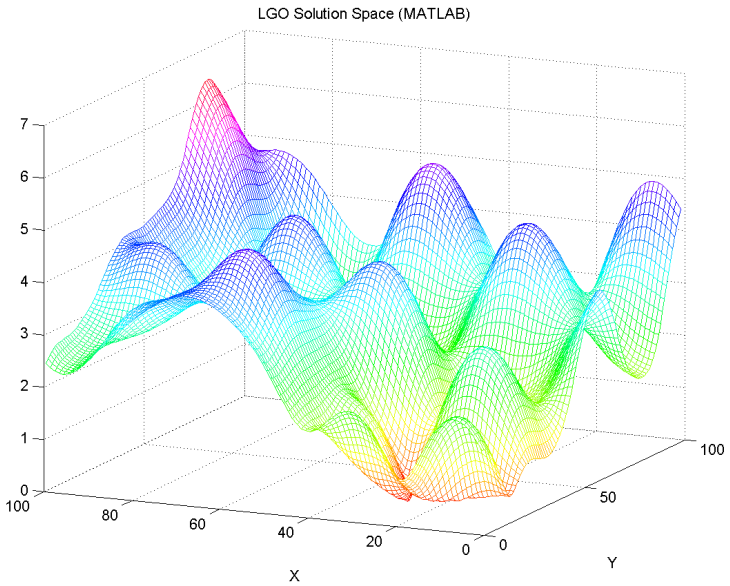


Figure: Random MATLAB Figure

- Created by Clive Moler in the late 1970s.
- The idea was to give CS students an easy way of accessing Fortran software such as LINPACK.
- Portmanteau for MATrix LABoratory

Why use MATLAB?

`http://www.mathworks.com/products/matlab/`

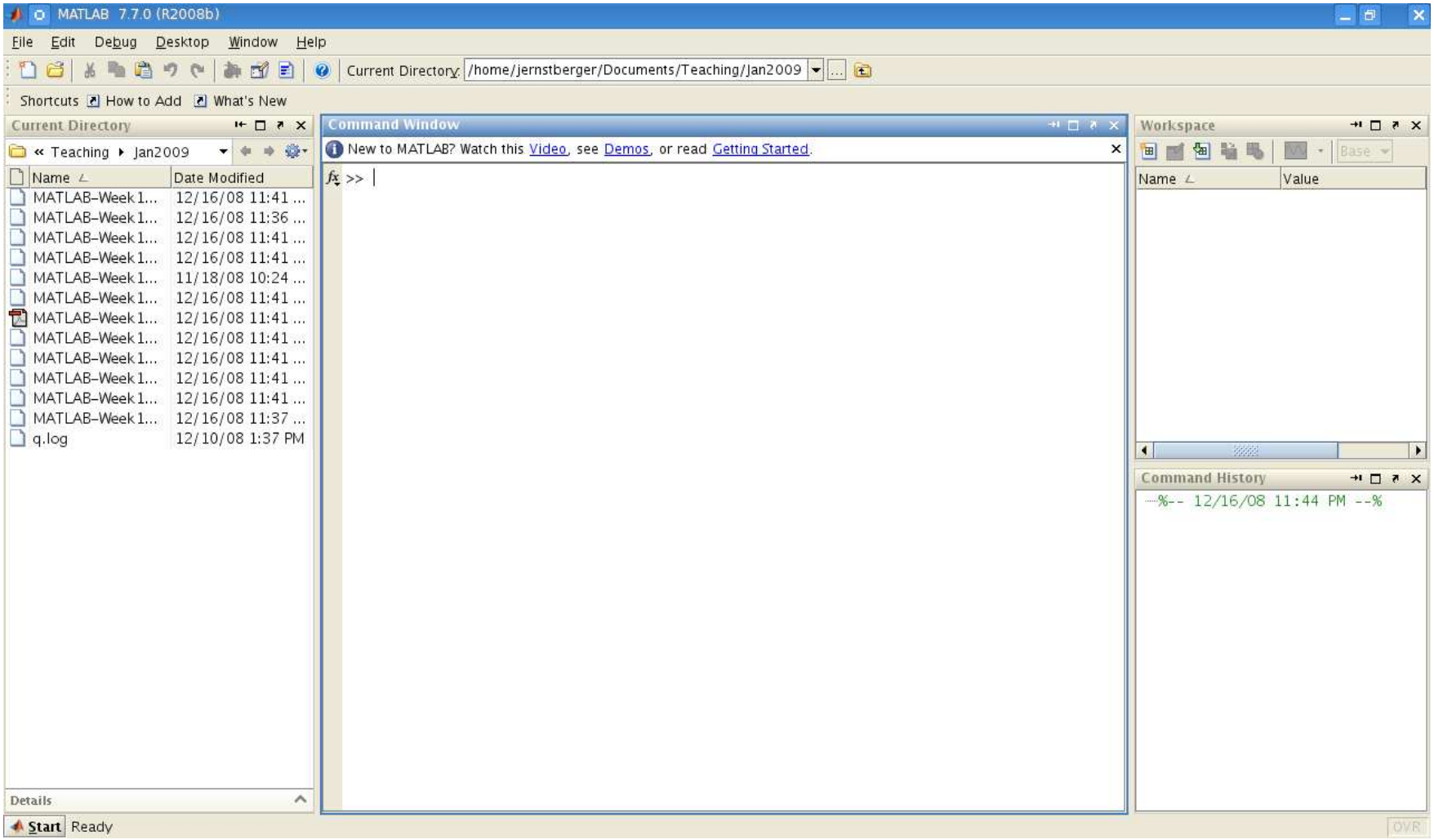
- Pros
  - Very high level!
  - Rapid developement. Easy to write code and generate results.
  - Graphical output is quick and easy.
  - Make text-based output very easy (LaTeX, html, Excel)
- Cons
  - Most numerical computation is written in C. You must interface with some well-known softwares.
  - MATLAB is, in fact, Java-driven and is inherently slower than the fastest programming languages.
  - Must have solid hardware.
  - Expense. $599 for the standard version. Each toolbox is an additional $100.

Installation

You will need:

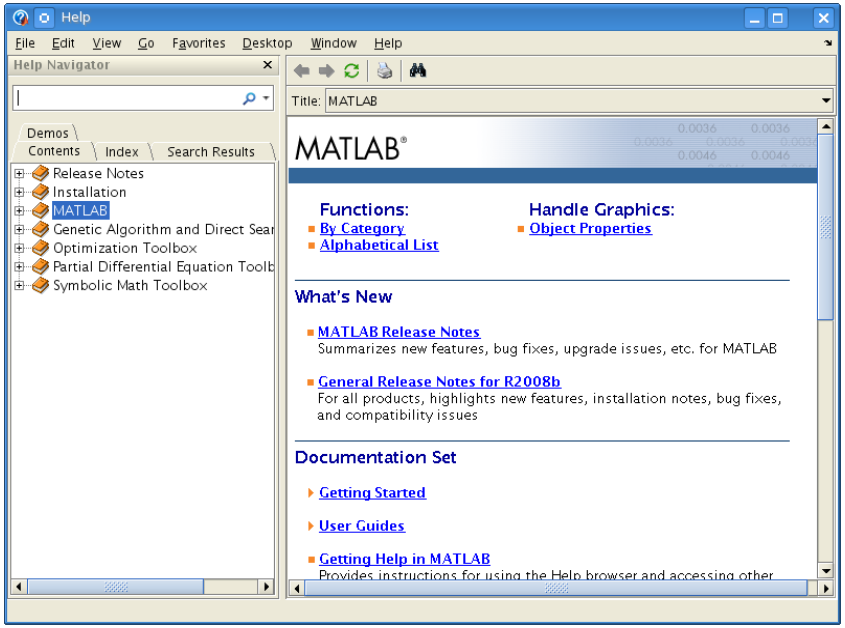
- A Personal License Passcode (PLP)
- Installation DVD
- Ample Hardisk Space
- Computer With Sufficient Hardware Requirements

Get it Started!



MATLAB Help

- Perhaps your most used resource in MATLAB.



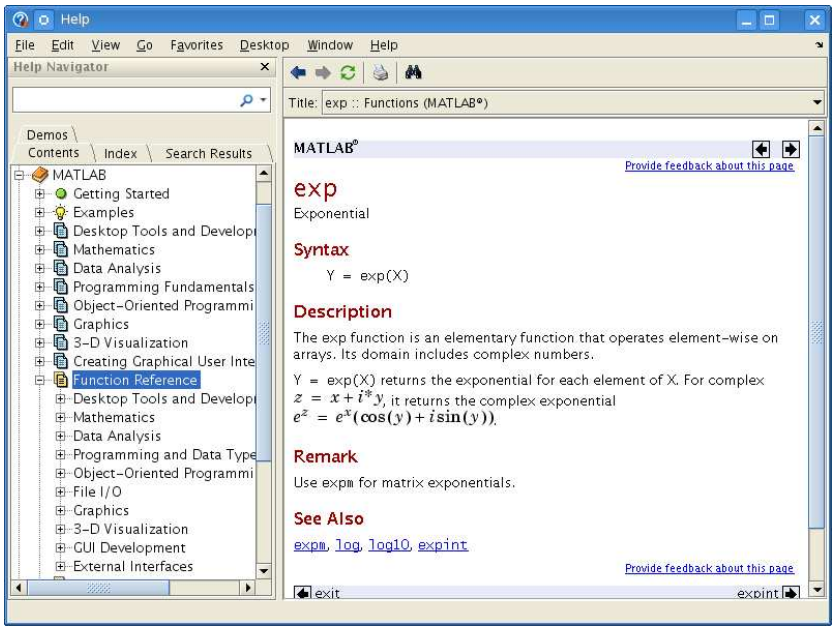
- At the MATLAB window type

```
help exp
```

MATLAB Documentation

- Similarly, at the MATLAB window, type

```
doc exp
```



- The documentation is typically more detailed with more help.

Declaring Variables

Dynamic Typing

MATLAB is dynamically typed. You do not have to define your variables explicitly.

Standard Precision

MATLAB does arithmetic using a standard double-precision arithmetic (accurate to about 15 places past the decimal).

Declaring Variables,cont.

- Constants. In the MATLAB window, type

```
x=1;
```

  - First notice "=".
  - Second notice ";". What happens without ";"?
  - This is really a 1×1 matrix.

- Matrices. In the MATLAB window, type

```
A=[1,2;3,4];
```

cd

  - What do the "[" and "]" do?
  - What about the "," and ";"?
  - How might I create a 4x4 matrix that has the numbers ascending in value from 1 to 16?

Workspace

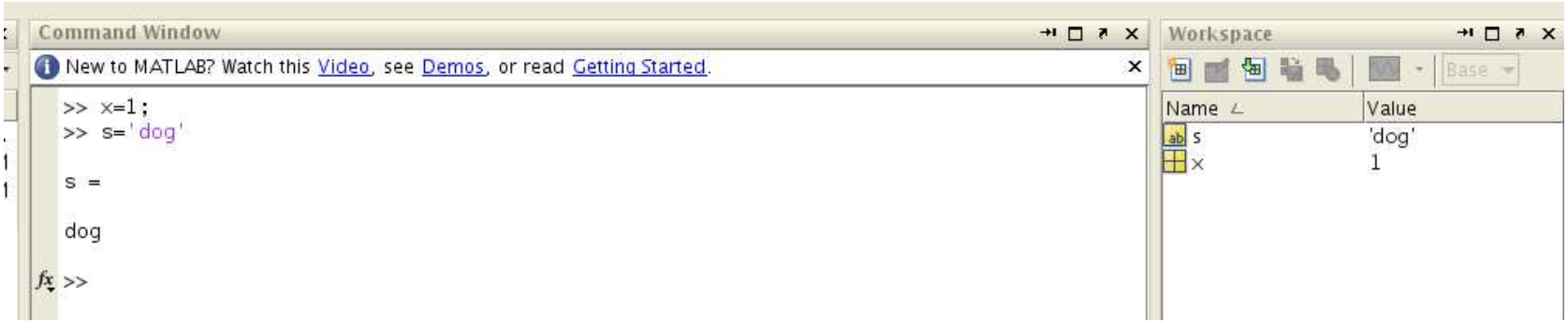


Figure: Variables declared and showing up in the "workspace" block.

Note the following:

- MATLAB will help you keep track of variable usage.
- MATLAB will tell you the type of the variable in use.
- MATLAB will tell you the dimension of the vector variable.

In-Class Exercises

Work on these in groups of 2-3.

- Attempt to find three good online references for MATLAB usage.
- Do a 'help sin' in the terminal and then evaluate at 2π (hint: use 'help' or 'Google' to figure out how to input π).
- Do a 'doc sin' at the command line.