How to Start and Run MATLAB

• On a Mac or PC, run as you would any other program..just point and click

• All 12 PC’s in the building 26 computer lab have MATLAB 6.5 (and Solver!!) now installed
Running MATLAB on MIT server….

• At the MIT server prompt, type:
  – MITserver% add matlab;
  – MITserver% matlab

• First time, make a subdirectory:
  – MITserver% mkdir ~/matlab

• In MATLAB, you can access additional MIT server options by typing:
  – help MIT server
  – On some workstations, you can access newer version of MATLAB by typing:
    • matlab-desktop at the matlab prompt
MATLAB Helpdesk

- At the MATLAB prompt, type:
  - helpdesk

This will give you a searchable command help index which is toolbox specific and more similar to the help resources that you will see in the PC version 6.xx
MATLAB Basics

Functions:

- Matrix formulation: fast calculation
- Strong in numerical, but weak in analytical
- General purpose math solvers: nonlinear equations, ODEs, PDEs, optimization

Basic mode of usage:

- Interactive mode
- Permanent MATLAB files (M-files)
  - M-script
  - Functions

➤ M-script and Functions must be written in separate files
- Note: M-files are saved in “Work” folder in the MATLAB program files subdirectory
# Basic Syntax

- Case sensitive variable name
- Library of Reserved Words
  - These will appear in blue if you are writing your code as an M-file
- End statements with a “;”
- Vector: Vec(i)
- Matrix: Mat(i,j,...)
- Element by element matrix operations:
  - “.*, ./, .^2”
- General matrix operations:
  - Cross product (*)
Syntax for Variable Assignment

- **Simple Variable**
  - Type $A = 4$;

- **Vector**
  - Type $A = [1 2 3 4]$;

- **Matrix**
  - Type $A = [1 2 3 4; 5 6 7 8]$;
Variable Assignment Continued

• Assignment of one value in a matrix
  – Type b = A(2,1); (same as b=5 here)

• Incremental Vectors
  – Typing:
    • Z = (1:5) gives increments of 1
      – i.e. Z = [1 2 3 4 5]
    • Z = (1:3:7) gives increments of 3 between 1 and 7
      – i.e. Z = [1 4 7]
Two Important Points

• If you do not put a semi-colon at the end of the line, the result of the operation for that line will be displayed when your program is run => BE CAREFUL!!

• Assignment vs. Equals: Important in Loops!
  – Assignment: a = b
  – Equals: a == b
Looping in MATLAB

• For Loop

    for I = 1:N
        for J = 1:N
            A(I,J) = 1/(I+J-1)
        end
    end

• All Boolean expressions work

  ➢ Less than: <, Greater than: >, Equal to: ==, Not equal to: ~=, Less than or equal to: <=, Greater than or equal to: >=.
Looping Continued…

• If Statement

```matlab
if I == J
    A(I,J) = 2;
elseif abs(I-J) == 1
    A(I,J) = -1;
else
    A(I,J) = 0;
end
```

• As in C++, While loops can also be executed in MATLAB
## Basic MATLAB Commands

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<th>Matlab commands</th>
<th>Functions and descriptions</th>
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<tr>
<td>help <em>functionname</em></td>
<td>Matlab on-line help for functions</td>
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<td>lookfor <em>searchphrase</em></td>
<td>To find matlab function with descriptions containing the search phrase</td>
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<td>who</td>
<td>To list all variables currently used</td>
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<td>size(<em>matrix</em>)</td>
<td>To identify the dimensionality of the <em>matrix</em> (use length(<em>vector</em>) for a vector)</td>
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<tr>
<td>ones(<em>m</em>,<em>n</em>)</td>
<td>To create a unit matrix of size <em>m</em> x <em>n</em></td>
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<tr>
<td>print –depsc <em>filename</em>.ps</td>
<td>To print an active plot (later use lpr to print in MIT server)</td>
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Comments

• You can write comments between and after lines of code by typing “%” in front of your message
• You should write your name and assignment info on top of each program
• Lastly, use comments throughout the code to show me that you know what you’re doing
Plotting Your Data

• After you have called your function (and assigned a variable name to the sol’n)
  – Type: figure (don’t need a semicolon here)
  – Type: plot(t,X)
    • t is your time vector and X is the sol’n vector that you named in your function call or part of your sol’n matrix (i.e. X(:,1), first column of matrix)
  – Note: You can type semilogx(t,X) or semilogy(t,X) to get a semilog plot of your choosing
Plotting Your Data Continued..

• Typing “hold on” after introducing a second figure will allow you to plot multiple curves on the same set of axes

• Using the “subplot(x,y,z), plot(t,X)” sequence will allow you to plot a matrix of graphs of size (x,y) on the same page, with z being the location of the graph in the matrix

• Typing “plot(t,X,’letter’)” will allow you to control the color of the line for that plot, type ‘help plot” in prompt to see the color key
Labelling Axes, Making Legends

• For the plot title, type:
  – title('title')

• For the x and y axes, type:
  – xlabel('axis name')
  – ylabel('axis name')

• To make a legend, type:
  – legend('name of curve 1, ’name of curve 2’, etc.)

• Type all of these commands after each figure and plot command so that I know what you are presenting in each graph!!
Saving Your Work

• In the MATLAB prompt, type:
  – `save filename`

• In Windows, just use the save icon or the save option in the drop down menu under file

• Make sure that your file is saved in the proper directory so that it can run from the MATLAB prompt
  – In MIT server this is the directory you named the first time you ran MATLAB
  – In Windows, it is normally the “Work” folder
Running Your Saved Work

• Type the name of the M-file in the Matlab prompt and hit enter
  – Also make sure that any functions that your program uses are in the same directory as this main M-file
• If there are any errors in your code, they will show up as messages in red text in the prompt window
Some advice on getting help…

• **USE THE HELP SEARCH TOOL**
  – In MATLAB 6.xx, type:
    • `help functionname`
  – In the MIT server clusters, version 5.xx, use the helpdesk option

• **Debug carefully**
  – Write your code a little at a time
  – Use flags to see where errors are

• If debugging is going nowhere, ask a friend to check things out
MIT Help

• Go to:


• The Copy Tech also has printouts of basic MATLAB commands and operations, you can pick up a copy for free there
If you have a Pentium 4 and you have MATLAB Version 6.0……

- Go to:


- Search for Pentium 4, Matlab version 6.0, and you’ll be directed to a link that gives you instructions to fix everything.