Two-Dimensional Plotting

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Overview

Any decent mathematical software must provide some ability to present results in a graphical format. `MATLAB` is decent software, so it must have graphical capabilities. This lab introduces the basics skills needed to create and manipulate `MATLAB` graphs. (There is no real linear algebra content.)

`MATLAB` plot commands introduced in this lab include: `plot`, `clf`, `xlabel`, `ylabel`, `title`, `hold`, `figure`, and `close`. Other new `MATLAB` commands introduced in this lab include the array multiplication (`.*`) and array power (`.^`) commands.

Part I

The best place to start to learn about `MATLAB` graphics is the online help: `help plot`. *Take a look at this help information - NOW!* Notice that the simplest usage of `plot` is `plot( x, y )` where x and y are vectors with the same number of elements.

Plotting a Function on an Interval

≫ **x = -4 : 0.04 : 4;**	% **partition interval** $[-4,4]$ **w/ mesh size** 0.04
≫ **y = sin(x);**	% **apply sine function to each component of x**
≫ **plot(x, y)**	% **display graph of** $y = \sin x$ **on** $[-4,4]$
≫ **clf**	% **clear the** `MATLAB` **figure window**

Changing the Line Style in a Plot

≫ **clear x y**	% **clear values from x and y**
≫ **x = -1.5 : 0.01 : 1.5;**	% **partition interval** $[-1.5, 1.5]$ **with mesh size** 0.01
≫ **y = exp(-x.^2);**	% **compute** e^{-x^2} **for each component of x**
≫ **plot(x, y)**	% **display graph of** $y = e^{-x^2}$ **on** $[-4,4]$
≫ **xlabel('x-axis')**	% **add label to the** x**-axis**
≫ **ylabel('y-axis')**	% **add label to the** y**-axis**
≫ **title('My Second MATLAB Plot')**	% **add title to the figure**

This shows only the most basic usage of these commands. Please consult `help xlabel`, `help ylabel`, and `help title` for additional usages of these commands. See `help arith` to better understand array multiplication (`.*`) and array power (`.^`) and how they compare with matrix multiplication (`*`) and matrix power (`^`).

Changing the Line Style in a Plot

```
≫ clf                              % clear any existing figure
≫ plot( x, y, '-.' )               % what does the third argument do?
```

Additional information about the line styles, color, and symbols is contained in `help plot`.

Multiple Plots in One Figure

```
≫ t = -1.5 : 0.1 : 1.5;
≫ s = t.^3;                        % note the use of .^
≫ plot( t, s )                     % graph of y = x³ replaces graph of y = e^{-x²}
≫ hold on                          % future plot commands add to existing figure
≫ plot( x, y )                     % graph of y = e^{-x²} and graph of y = x³
```

Two plots can be shown in the same figure using a single `plot` command as follows:

```
≫ figure                           % create a new figure (plotting window)
≫ plot( x,y,'ro', x,x.^3,'b+' )    % graphs of y = e^{-x²} with red circles
≫                                  % and graph of y = x³ with blue plusses
≫ close all                        % close all figure windows
```

Please remember that a figure that looks good on the screen (in color) might not look very good when printed on a black-and-white printer.

In Part II you will be asked to use MATLAB to create some specific figures.

Clear all variables before you begin to work on Part II.