OBJECTIVES

The main purpose of this in-class exercise is to use MATLAB to generate plots (simple y versus x plots, multiple (overlay) plots, and subplots).

NOTES

MATLAB COMMANDS

Throughout this document, the MATLAB commands that you must use in your scripts will appear in **`bold`** face.

COMMENTING

Comment your codes extensively. You can use the percent symbol `%` to enter comments in your scripts. Comments allow the user to understand and follow code easily; it is therefore highly recommended to develop a habit to extensively provide commentary in your codes.

A nice feature you may want to use in your scripts is code sectioning. Code sections allow you to organize, add comments, and execute portions of your code. Code sections begin with double percent signs (`%%`), e.g.,

```
%% Vector Operations
% You can perform a number of binary operations on vectors.
%%
A = 1:3;
B = 4:6;

%% Dot Product
% A dot product of two vectors yields a scalar.
% MATLAB has a simple command for dot products.
s = dot(A,B);

%% Cross Product
% A cross product of two vectors yields a third
% vector perpendicular to both original vectors.
% Again, MATLAB has a simple command for cross products.
v = cross(A,B);
```

CODE COPY-AND-PASTE

If you decide to copy and paste example command(s) presented in lecture slides and in-class exercises in MATLAB, be wary of single quotation marks—you may need to delete and re-enter single quotation marks after pasting the command(s) in MATLAB.

EXERCISE 5: PLOTS

PART A

The purpose of this exercise is to write a MATLAB script to generate various plot types on the same figure window. Create a script and name it `matlabExercise5a.m`. In your script,

- Generate a figure that contains a 2×2 subplot (i.e., a subplot with 2 rows and 2 columns) structure
- Plot a family of polynomials $y = x^n$, $-1 \leq x \leq 1$, for $n = 1, 2, 3, 4$ in the first subplot (the graph located in the first row and first column). In generating the vector `x`, use an increment of `0.01`. You can use any of the overlay options discussed in lecture notes to generate this plot
- In the second subplot (the graph located in the first row and second column), plot $y = x^2$ for $0 \leq x \leq 20$ but use MATLAB's **`semilogx`** command. In generating the vector `x`, use an increment of `0.5`
- In the third subplot (the graph located in the second row and first column), plot $y = x^2$ for $0 \leq x \leq 20$ but use MATLAB's **`semilogy`** command
- Finally, in the fourth subplot (the graph located in the second row and second column), plot $y = x^2$ for $0 \leq x \leq 20$ but use MATLAB's **`loglog`** command
- For the first subplot, provide the following graph title (**`title`**): Plot of $y = x^n$ for $n = 1, 2, 3, \&4$
- For the other subplot, provide the following graph titles: $y = x^2$ as linear/log (for second subplot); $y = x^2$ as log/linear (for third subplot); and $y = x^2$ as log/log (for fourth subplot)
- Finally, for all the subplots, provide the following x- and y-axis labels (**`xlabel`**, **`ylabel`**): Independent Variable and Dependent Variable, respectively

PART B

Create a script and name it `matlabExercise5b.m`. In your script, and using the example **`switch-case`** code block presented in lecture slides, ask the user which line color (choices are: black **`'k'`**, red **`'r'`**, or green **`'g'`**) they would like to use for the second, third, and fourth graphs before generating the subplot structure created in PART A. (*Hint: First determine which color the user would like to use, then use that information in your **`plot`** commands*)

EXTRA EXERCISES

Additional exercises are included for extra practice purposes. I encourage everyone to work on them, but first complete the regular exercises—the ones without an X next to their number—then work on the extra exercises.

EXERCISE 5X: PLOTS

Plot a family of polynomials $y = x^n$, $-1 \leq x \leq 1$, for $n = 1, 2, 3, 4$. In generating the vector `x`, use an increment of `0.01`. Use a blue color and solid line type to depict condition $n = 1$; a red color and dashed line to depict condition $n = 2$; a black color and dotted line to depict condition $n = 3$; and a green color and dashdot line to depict condition $n = 4$. Make sure that the line width for each graph is set to 2 (see the help documentation for the **`plot`** command for details). Add a legend to

the figure; specifically, use MATLAB's **`legend`** command (type `help legend` for details). Provide the following graph title (**`title`**): Plot of $y = x^n$ for $n = 1, 2, 3, \&4$ and x- and y-axis labels (**`xlabel`**, **`ylabel`**) Independent Variable and Dependent Variable, respectively. Save your figure in PNG format using MATLAB's **`print`** command (use 300 dpi).