

Homework Rules

A complete description of the rules and procedures for homework assignments is provided in the course syllabus. The following is a list of some of the key points:

1. You must include a title page to your homework and do not include any work on it.
2. If you are using engineer paper, do not use the back side because it is too difficult to read.
3. Provide your work and answers to the problems in the same order they were asked.
4. Unless otherwise instructed, you must solve the homework by hand. Only use a computer or a calculator for doing basic arithmetic or to verify your answers.
5. You must show all work or you will not receive credit for the answer.
6. You must finish all calculations. For example, 3π , $5/8$, and $\sqrt{14}$ are not finished answers and will be graded as incorrect. Correct answers (depending on significant digits) would be 9.425, 0.625, and 3.742, respectively.
7. Answers must include proper units or the answer will be graded as incorrect.
8. You must draw a box around your final answer or it will be graded as incorrect.
9. Never box intermediate results or your answers will be graded as incorrect.
10. Be sure your homework is clear, neat, and organized or points will be deducted.
11. Staple the assignment in the upper-left corner with no additional binding.
12. Homework is due by 4:59pm on the due date, but submitting in class is preferred. Homework not submitted in class shall be submitted to the ECE office to be placed in my mailbox.
13. Late homework will not be accepted and will be given a grade of zero. There cannot be any exceptions to this rule due to the size of the class.
14. Unless otherwise instructed, all MATLAB codes shall be placed in an Appendix at the end of the assignment.
15. All graphics checklists shall be placed at the end of the assignment.

Reading

Assignment: Review MATLAB Documentation.
<https://www.mathworks.com/help/matlab/index.html>

Lectures: Topic 2, *MATLAB Basics* and *Generating Professional Graphics*.
From *Computational Methods for Engineers*
https://empossible.net/academics/emp4301_5301/

Professional Graphics

Problem #1 – Line Plots

Create a professional plot of the following three functions on the same plot in the range $-10 < x < 10$. Complete and sign a graphics checklist for the plot and attach the checklist to the end of the assignment.

$$f_1(x) = \cos(x)$$

$$f_2(x) = \exp\left[-(x/2)^2\right]$$

$$f_3(x) = \cos(x)\exp(-x^2)$$

Problem #2 – Image Plots

Create a professional plot of the real part of the function $f(x, y)$ using the `pcolor()` command. Complete and sign a graphics checklist for the plot and attach the checklist to the end of the assignment.

$$f(x, y) = \frac{\exp(-jkr)}{\sqrt{r}}$$

$$r = \sqrt{x^2 + (y/2)^2}$$

$$k = \frac{2\pi}{\lambda}$$

$$\lambda = 1$$

$$-7 < x < 7$$

$$-5 < y < 5$$

MATLAB Basics

Problem #3 – Arrays Vs. Matrices

Given the definitions for \mathbf{A} and \mathbf{B} below

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} 3 & 5 & 7 \\ 1 & 9 & 6 \\ 2 & 8 & 4 \end{bmatrix}$$

Calculate the following

$$\mathbf{A} + \mathbf{B}$$

$$\mathbf{A} - \mathbf{B}$$

$$\mathbf{A} * \mathbf{B}$$

$$\mathbf{A} . * \mathbf{B}$$

$$\mathbf{A} / \mathbf{B}$$

$$\mathbf{A} . / \mathbf{B}$$

Explain why $\mathbf{A} * \mathbf{B}$ and $\mathbf{A} . * \mathbf{B}$ give different answers. Similarly, explain why \mathbf{A} / \mathbf{B} and $\mathbf{A} . / \mathbf{B}$ give different results.

Problem #4 – Solutions to Matrix Equations

Given the following matrix equation, calculate a , b , c and d .

$$\begin{bmatrix} 0 & 1 & 3 & -2 \\ 6 & -1 & 0 & 4 \\ 3 & 0 & -1 & -3 \\ -4 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} = \begin{bmatrix} 23 \\ 4 \\ -4 \\ 4 \end{bmatrix}$$

In addition, calculate the eigen-vector matrix \mathbf{V} and eigen-value matrix \mathbf{D} of the 4x4 square matrix above.