

CS 101 (6, 16) Computer Programming & Problem Solving

Homework #1

DUE: 11:00pm, Feb. 5, 2021

NAME:

STUDENT ID#:

NOTES: Submit only the homework “solution” (do not include these homework questions) in Microsoft Word format to Canvas before the above deadline. Absolutely, I will not accept late submission. Work independently and write the answers in your own Matlab codes. Any plagiarism will cause a “ZERO” score or a “FAIL” grade.

- Create a word file ‘HW1S.doc’ and fill in your NAME and STUDENT ID#. Use Matlab to solve the problem. Copy the Matlab code and answer to paste on the file.
- Submit it in a Microsoft Word file. Do not include the questions; just provide the required codes and answers in the file.
- Totally, there are 5 questions. Each question is 20 points. Grading policy checks the correctness and completion of showing resulting answers and Matlab codes. You must use the file name “HW1S.doc” to submit it to Canvas and provide Matlab code and the resulting answers. Otherwise, you will receive a penalty.

1.1 (20 points) Calculate the following problems in the Matlab Command Window. Show the

Matlab code and answer. (a) $\frac{(14.8^2 + 6.5^2)}{3.8^2} + \frac{55}{\sqrt{2} + 14}$ (b) $(-3.5)^3 + \frac{e^6}{\ln 524} + 206^{1/3}$

(c) $2.34 + \frac{1}{2} \times 2.7 \times (5.9^2 - 2.4^2) + 9.8 \ln 51$ (d) $\frac{\sin\left(\frac{7\pi}{9}\right)}{\cos^2\left(\frac{5}{7}\pi\right)} + \frac{1}{7} \tan\left(\frac{5}{12}\pi\right)$

(e) $\frac{\tan 64^\circ}{\cos^2 14^\circ} - \frac{3 \sin 80^\circ}{\sqrt[3]{0.9}} + \frac{\cos 55^\circ}{\sin 11^\circ}$ (f) $\tan^2\left(\frac{\pi}{10}\right) * \log_2(10\pi + e^3) + \sin(30^\circ)^5$

1.2 (20 points) Define two variables: alpha = $5\pi/8$, and beta = $\pi/8$. Using these variables to show that the following trigonometric identity is correct by calculating the values of the left and right sides of the equation. Write the MATLAB code in a Script file, called **hw0102.m** and then run it on Command Window. Show the Script file and the result in the Command Window.

$$\sin \alpha \cos \beta = \frac{1}{2} [\sin(\alpha - \beta) + \sin(\alpha + \beta)]$$

1.3 (20 points) The distance d from a point (x_0, y_0, z_0) to a plane $Ax + By + Cz + D = 0$ is given

by:
$$d = \frac{|Ax_0 + By_0 + Cz_0 + D|}{\sqrt{A^2 + B^2 + C^2}}$$

Determine the distance of the point $(8, 3, -10)$ from the plane $2x + 23y + 13z - 24 = 0$. First define the variables A, B, C, D, x_0, y_0 , and z_0 , and then calculate d . (Use the `abs` and `sqrt` functions.) Write the MATLAB code in a Script file, called **hw0103.m** and then run it on Command Window. Show the Script file and the result in the Command Window.

1.4 (20 points)

(a) Use a single command to create a row vector (assign it to a variable named `b`) with 19 elements such that

$$b = 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 9 \ 8 \ 7 \ 6 \ 5 \ 4 \ 3 \ 2 \ 1$$

1. Use `array`
2. Use `linspace()`

(b) Create the following matrix by using vector notation for creating vectors with constant spacing and/or the `linspace` command. Do not type individual elements explicitly. Show the Matlab code and answer.

$$A = \begin{bmatrix} 0 & 5 & 10 & 15 & 20 & 25 & 30 \\ 600 & 500 & 400 & 300 & 200 & 100 & 0 \\ 0 & 0.8333 & 1.6667 & 2.5 & 3.3333 & 4.1667 & 5 \end{bmatrix}$$

1.5 (20 points)

Create three row vectors:

$$a = [7 \ 2 \ -3 \ 1 \ 0], \quad b = [-3 \ 10 \ 0 \ 7 \ -2], \quad c = [1 \ 0 \ 4 \ -6 \ 5]$$

- (a) Use the three vectors in a MATLAB command to create a 3×5 matrix in which the rows are the vectors a, b , and c .
- (b) Use the three vectors in a MATLAB command to create a 5×3 matrix in which the columns are the vectors a, b , and c .
- (c) Calculate $M = a*b$
- (d) Is $a.*b$ a legal expression, and why?

Write the MATLAB code in a Script file, called **hw0105.m** and then run it on Command Window. Show the Script file and the result in the Command Window.