**MATLAB For Scientists**

**HW2**

**Instructions**

Answer each question below using a **single** script. Submit the script titled HW2\_studentID\_script.m, to Canvas. Separate each question with double percent signs and rewrite the main question prompt in a block of comments as shown below. Then, use comments to designate question sub-parts. For example:

**%% Question 1**

% Write the MATLAB command that performs the following operations. Store each

% output in a variable with the name of your choice. Display the answer using

% disp and the variable name according to the instructions above.

% Q1 part a:

% Q1 part b:

Ensure each question follows the guidelines below:

* **The display answer to every question should begin with the question # and part.** Ex: for Q1 part a, disp(“Question 1a: “ + …).
* When specified, the answer should be displayed in **a grammatically correct complete sentence**, including spaces where appropriate, and punctuation marks.
* Suppress **all** intermediate outputs. Only the answers should display on the command line.
* No hard coding beyond the minimal necessary.

**Problems**

**Question 1 (2 pt):**

Use MATLAB to generate the following vectors. In each case, display the correct syntax of the command, not the vector itself. However, you should check the syntax to make sure it’s correct. To demonstrate this, the correct answer to 1a is included below:

1. One random real number in the range 0 to 1

disp("Question 1a: rand\_var = rand;")

1. One real number in the range 20 to 50 using rand
2. One integer in the range 0 to 10 using randi
3. Five real numbers in the range 0 to 20 using rand
4. A 1x5 array of integers in the range 10 to 100 using randi

**Question 2 (2 pt):**

Define a row vector called vec containing the numbers 1,2,3,4, and 5 in increasing order, using the following methods:

1. Manually (writing out the numbers directly)
2. Using the colon operator
3. Using linspace
4. Transposing a column vector

In each case, display the correct syntax of your command, not the vector itself (see example 1a above).

**Question 3 (1.5 pt):**

Use the colon operator to define the following row vectors:

1. vec1 = [1.000 1.5000 2.000 2.5000 3.000]
2. vec2 = [5 4 3 2 1]
3. vec3 = [10 8 6 4 2 0]

In each case, display the correct syntax of your command, not the vector itself (see example 1a above).

**Question 4 (0.5 pt):**

Write the correct syntax that will save all three vectors (vec1, vec2, and vec3) in a .mat file called “Q4\_vectors”. Leave this line commented out, and in your displayed answer, include the line number that the grader should refer to (e.g., “Question 4: See line XX”).

**Question 5 (2 pt):**

Define vec2 as above, and determine the size of vec2 (e.g., both rows and columns) using the size function and the correct dimension. Store both the row and column number in a separate variable. Display the row # and column # of this vector using a complete sentence. In your display, also include “see line X” to point the grader to the right location.

**Question 6 (2 pt):**

Define a matrix that is entirely ones, and is of the size 3x2, using the specified syntax:

1. Manually (e.g., using only commas and semicolons)
2. Using the ones function
3. Concatenating 3 individual vectors of equal size
4. Concatenating 2 individual matrices of unequal sizes

For all parts, use the display function to point the grader to the appropriate lines in each case.

**Question 7 (3 pt):**

Define new matrices according to the following specifications:

1. Define two new variables: the first should be called mat\_10 that is of the size 3x3 and consists of all 10’s using any MATLAB-provided functions (e.g., do not use manual matrix notation). The second should be called mat\_rand that is of the size 3x3 and consists of all random numbers between zero and 1. Use display to point the grader to the appropriate lines.
2. Define a new variable called mat\_new that stores the absolute value of the mat\_rand subtracted from mat\_10. Use display to point the grader to the appropriate lines.
3. Define a new variable called mat\_concat that is of the size 3x6 by concatenating any two of the matrices defined in a previous part of this question. Use display to print the size of mat\_concat using a complete sentence.

**Question 8 (3 pt):**

Create a 3x5 matrix and a 3x2 matrix, both of random integers between 0 and 10, and do the following:

1. Determine and display the type of matrix concatenation (horizonal or vertical), and the corresponding MATLAB dimension, that these two matrices can be concatenated along.
2. Display the syntax that shows how to define a new variable called mat that consists of the concatenation of these two random matrices.
3. Create a matrix of all ones that is the same size as mat. To do this, you must use the size and ones functions in the same line of code. Display this syntax in a complete sentence.