ENGR 15100: Software Tools for Engineers
Spring 2015

Computer Assignment #2

Due Date: Tuesday, February 3, 2015, 9am CST

Departments of Engineering
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1. OBJECTIVE

Become familiar with creating, addressing, and deleting vectors and matrices in MATLAB.

2. PROCEDURE

Task I: [50 points] Creating, Addressing, and Deleting Vectors in MATLAB

Create a MATLAB script file having the name `LASTNAME_LAB2_TASK1.m`. Then, carry out the following sequence of steps in the script file `LASTNAME_LAB2_TASK1.m`. ***Unless otherwise specified, do not suppress the output to the MATLAB Command Window.***

(a) **[0.5 points]** Clear all currently defined variables from the MATLAB Workspace

(b) **[0.5 points]** Clear the contents of the MATLAB Command Window.

(c) **[1 point]** Activate a *diary* in a file named `LASTNAME_LAB2_TASK1_DIARY.txt`.

(d) **[1 point]** Create a *variable* named `full_name` and assign to it a string indicating your full first and last name separated by a blank space. Suppress the output to the MATLAB Command Window. Then, using variable `full_name` in combination with the **`disp()`** function, display your full name in the MATLAB Command Window.

(e) **[3 points]** Create *variables* `a`, `b`, and `c`. Assign the scalar values 5, -3.75, and $\frac{\pi}{3}$ to variables `a`, `b`, and `c`, respectively.

(f) **[4 points]** Create a *variable* named `row_vector0` and assign to it the row vector shown below.

$$[a \quad b \quad c \quad a! \quad |b| \quad sign(b) \quad round(88c) \quad fix(b)]$$

(g) **[4 points]** Create a *variable* named `row_vector1` and assign to it a row vector whose element values are equally spaced and in range from 16 down to 0 in increments of 0.5. Utilize the MATLAB colon (`:`) operator.

(h) **[5 points]** Create a *variable* named `row_vector2` and assign to it a row vector. The first and last elements of the row vector should have the values 0 and 16, respectively. The number of elements of the row vector should be the same as that of `row_vector1`. Accomplish this step with *one line of code* using a combination of built-in functions **`linspace()`** and **`length()`**.

(i) **[6 points]** Create a *variable* named `column_vector0` and assign to it the *column vector* below.

$$\begin{bmatrix} -9.86 \\ 4.45 \\ sin(b/c) \\ e^{\sqrt[a]{2.6a+9.3c}} \\ ceiling(b) \\ floor(b) \end{bmatrix}$$

(j) **[2 points]** Create a *variable* named `element4` and assign to it the 4^{th} element of `row_vector1`.

(k) **[2 points]** Create a *variable* named `row_vector1_double_length` and assign to it a scalar whose value is *twice the number of elements* of `row_vector1`. Use the built-in `length()` function.

(l) **[2 points]** Create a *variable* named `first5_elements` and assign to it a row vector whose elements are the first five elements of `row_vector1`.

(m) **[3 points]** Create a *variable* named `even_elements` and assign to it a row vector whose elements are those from `row_vector1` having *even* addresses/indices/positions.

(n) **[3 points]** Create a *variable* named `my_elements1` and assign to it a row vector whose elements are those from `row_vector1` that reside at addresses/indices/positions 3, 7, 9, and 16 through 19. Utilize the MATLAB colon (`:`) operator if possible.

(o) **[3 points]** Assign to the (nonexistent) addresses/indices/positions 8 through 14 of row vector `my_elements1` a row vector whose elements have equally spaced values in the range $[-\frac{\pi}{2}, \frac{\pi}{2}]$, inclusive. Utilize the MATLAB built-in `linspace()` function.

(p) **[3 points]** Create a *variable* named `my_elements2` by appending/concatenating the row vector `first5_elements` to the leftmost end of row vector `my_elements1`.

(q) **[3 points]** Delete all elements of row vector `my_elements2` whose addresses/indices/positions are multiples of 5.

(r) **[3 points]** Using one MATLAB statement, create a *variable* named `x` and assign to it the element of row vector `my_elements1` whose address/index/position is equal to the number of elements of row vector `first5_elements`.

(s) **[1 point]** Deactivate the *diary* contained in the file `LASTNAME_LAB2_TASK1_DIARY.txt`.

Task II: [50 points] Creating, Addressing, and Deleting Matrices in MATLAB

Create a MATLAB script file having the name `LASTNAME_LAB2_TASK2.m`. Then, carry out the following sequence of steps in the script file `LASTNAME_LAB2_TASK2.m`. Unless otherwise specified, ***do not suppress the output to the MATLAB Command Window***.

(a) **[0.5 points]** Clear all currently defined variables from the MATLAB Workspace

(b) **[0.5 points]** Clear the contents of the MATLAB Command Window.

(c) **[1 point]** Activate a *diary* in a file named `LASTNAME_LAB2_TASK2_DIARY.txt`.

(d) **[1 point]** Create a *variable* named `full_name` and assign to it a string indicating your full first and last name separated by a blank space. Suppress the output to the MATLAB Command Window. Then, using variable `full_name` in combination with the `disp()` function, display your full name in the MATLAB Command Window.

(e) **[3 points]** With one MATLAB statement/command, create a *variable* named `matrix0` and assign to it the following 3×3 *square matrix*.

$$\begin{bmatrix} 924 & 561 & 192 \\ -991 & -221 & 807 \\ 550 & -771 & 150 \end{bmatrix}$$

(f) **[10 points]** With one MATLAB statement/command, create a *variable* named `matrix1` and assign to it the following *matrix*.

$$\begin{bmatrix} 3.58 & -10.79 & 100 & \frac{pi}{2} & eps & -8.375 & 20 & 8.5 & 88.88 & -1000 \\ -20 & -14.4444 & -8.8889 & -3.3333 & 2.2222 & 7.7778 & 13.3333 & 18.8889 & 24.4444 & 30 \\ -600 & -500 & -400 & -300 & -200 & -100 & 0 & 100 & 200 & 300 \\ -40 & -36 & -32 & -28 & -24 & -20 & -16 & -12 & -8 & -4 \\ 0 & 1.1111 & 2.2222 & 3.3333 & 4.4444 & 5.5556 & 6.6667 & 7.7778 & 8.8889 & 10 \end{bmatrix}$$

Utilize the MATLAB colon (`:`) operator and the built-in `linspace()` function whenever possible. *Before moving on to the next step, inspect the output displayed in the MATLAB Command Window to ensure the matrix is correct.*

(g) **[3 points]** With one MATLAB statement, create a *variable* named `matrix2` and assign to it the following *matrix* made-up of the 1st and 3rd rows of `matrix0`.

$$\begin{bmatrix} matrix0\_row1 \\ matrix0\_row3 \end{bmatrix}$$

(h) **[2 points]** Create a *variable* named `element_35` and assign to it the element residing in the 5^{th} column of the 3^{rd} row of matrix `matrix1`.

(i) **[2 points]** Create a *variable* named `matrix1_dims` and assign to it a row vector whose elements indicate the dimensions (number of rows and columns) of matrix `matrix1`. Utilize the built-in MATLAB `size()` function.

(j) **[3 points]** Using one MATLAB statement/command, create a *variable* named `matrix1_num_of_elems` and assign to it the result of an expression that computes the total number of elements contained in matrix `matrix1`. The calculation should involve the row vector `matrix1_dims`.

(k) **[3 points]** Create a *variable* named `column4_vector` and assign to it a *column vector* whose elements are those contained in the 4^{th} column of matrix `matrix1`.

(l) **[3 points]** Create a *variable* named `column6_vector` and assign to it a *column vector* whose elements are those contained in rows 2 through 4 of the 6^{th} column of matrix `matrix1`. Utilize the MATLAB colon (`:`) operator.

(m) **[3 points]** Create a *variable* named `row3_vector` and assign to it a row vector whose elements are those contained in columns $1, 3, 6$, and 10 of the 3^{rd} row of matrix `matrix1`.

(n) **[3 points]** Create a *variable* named `matrix3` and assign to it a 3×4 *matrix* whose elements are those contained in matrix `matrix1` residing in columns 10 through 1 in increments of 3 of rows 1 through 5 in increments of 2. Utilize the MATLAB colon (`:`) operator.

(o) **[3 points]** Create a *variable* named `matrix4` and assign to it a 2×6 *matrix* whose elements are those contained in `matrix1` residing in columns $1, 2, 5$, and 8 through 10 of rows 1 and 4.

(p) **[2 points]** Assign the scalar value 100 to the (nonexistent) 6^{th} row and 6^{th} column of matrix `matrix2` thereby creating a larger matrix than the original.

(q) **[2 points]** Create a *variable* named `matrix5` and assign to it a matrix formed by appending matrix `matrix2` to the top of itself.

(r) **[2 points]** Delete the elements contained in columns 3 through 5 from matrix `matrix4` thereby reducing the number of columns of matrix `matrix4` by 3. Utilize the MATLAB colon (`:`) operator.

(s) **[2 points]** Delete the elements contained in rows 2 and 12 from matrix `matrix5` thereby reducing the number of rows of matrix `matrix5` by 2. Utilize the MATLAB colon (:) operator.

(t) **[1 point]** Deactivate the *diary* contained in the file `LASTNAME_LAB2_TASK2_DIARY.txt`.

Task III: Computer Assignment Submission

Upload the following files onto Blackboard Learn.

(a) MATLAB script file `LASTNAME_LAB2_TASK1.m`

(b) MATLAB diary file `LASTNAME_LAB2_TASK1_DIARY.txt`

(c) MATLAB script file `LASTNAME_LAB2_TASK2.m`

(d) MATLAB diary file `LASTNAME_LAB2_TASK2_DIARY.txt`