

MATLAB Marina: Arrays 2D

1. Create and execute a MATLAB script containing the statements in Figure 1. Examine the dimensions and values in each of the variables in the workspace after the script is executed.

```
clear; clc;
A1 = [2, -1, 4, 3;
      4, 13, 5 -8];
A2 = [-1, 0, 1, 0];
lA1 = length(A1);
[nR, nC] = size(A1);
A3 = [A1; A2];
```

Figure 1. MATLAB Statements for Problem 1

2. Create and execute a MATLAB script containing the statements in Figure 2. Examine the dimensions and values in each of the variables in the workspace after the script is executed. Briefly explain what each of the last three statements do.

```
clear; clc;
A = [2, -1, 4, 3;
     4, 13, 5 -8;
     -1, 0, 1, 0];
A23 = A(2,3);
Arow2 = A(2,:);
Acol3 = A(:,3);
```

Figure 2. MATLAB Statements for Problem 2

3. Create and execute a MATLAB script containing the statements in Figure 3. Examine the dimensions and values in each of the variables in the workspace after the script is executed. Briefly explain what each of the last two statements do.

```
clear; clc;
A = [2, -1, 4, 3;
     4, 13, 5 -8;
     -1, 0, 1, 0];
A(1,4) = 0;
A(3,:) = 0;
```

Figure 3. MATLAB Statements for Problem 3

4. Create and execute a MATLAB script containing the statements in Figure 4. Examine the dimensions and values in each of the variables in the workspace after the script is executed. What does the logic operation $A < 0$ return as a result? What does the statement `find(A < 0)` return as a result?

```
clear; clc;
A = [2, -1, 4, 3;
     4, 13, 5 -8;
     -1, 0, 1, 0];
A_log = A < 0;
A_ind = find(A < 0);
```

Figure 4. MATLAB Statements for Problem 4

5. From the MATLAB Command Window, create the following 2D arrays and assign them the specified initial values:
- A 4 by 5 array of all ones named O. Use the MATLAB function `ones`.
 - A 10 by 3 array of all zeros named Z. Use the MATLAB function `zeros`.
 - A 3 by 2 array named A with the values

$$A = \begin{pmatrix} 5 & 4 \\ 7 & 0 \\ -2 & 3 \end{pmatrix}.$$

- A 3 by 20 array with row containing the values from 1 to 20 with an increment of one, row 2 containing all zeros and row 3 containing all zeros.

6. Write a MATLAB program that will:

- Create the 2D array A with the values

$$A = \begin{pmatrix} 5 & -2 & 0 & 1 & 7 \\ 1 & 0 & 0 & -1 & 6 \end{pmatrix}.$$

- Index the element in row 1 and column 4 and save the value in the variable A24.
- Index all of row 2 and save the values in the variable Arow2.
- Index all of column 4 and save the values in the variable Acol4.
- Replace the values in row 2 with zeros.

7. Write a MATLAB program that will:

- Create a 2D array of zeros named fData with 101 rows and 3 columns.
- Replace the first column of fData with the integer values from 0 to 100.
- Replace the second column of fData with values from -5 to 5 and an increment of 0.1.
- Replace the third column of fData with the values of the function $f(x) = x^3 - 5x^2 + 3x + 2$ evaluated for the values in column 2.
- Plot the $f(x)$ values in column 3 of fData versus the x values in column 2 of fData.

8. Add statements to the program written for problem 8 that will:
 - a) Determine which $f(x)$ values in `fData` (column 3) are less than 0. The result should be a column array of logicals.
 - b) Which x values in `fData` (column 2) correspond to the $f(x)$ values that are less than 0. The result should be the x values for which $f(x) < 0$.

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