**ENED 1090: Engineering Models I**

**Homework Assignment #9**

**Due: Week of November 16th at the beginning of your Recitation Section**

**Problem 1: (Min and Max Functions)**

Create the following matrix in MATLAB:

M = 3 6 1 -2

3 0 -2 -4

8 -3 5 4

-2 -3 -2 5

For each of the following, use the max or min functions. Paste both the command and the result in the space below.

1. What MATLAB command would determine the smallest value in the entire matrix?

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Minimum = min(min(M))

Minimum =

-4

1. What MATLAB command would determine the largest value in each of the rows?

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Maximum = max(max(M))

Maximum =

8

1. What MATLAB command would determine the largest value in each of the columns?

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Maximum = max(M)

Maximum =

8 6 5 5

1. What MATLAB command would determine the largest value in row 4?

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Maximum = max(max(M(4,:)))

Maximum =

5

1. What MATLAB command would determine the largest value in columns 2 and 3?

(Note: we want a single value here not a maximum for each column)

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Maximum = max(max(M(:,2:3)))

Maximum =

6

**Problem 2:** (Sum Function)

Create the following matrix in MATLAB (same as Problem 1):

M = 3 6 1 -2

3 0 -2 -4

8 -3 5 4

-2 -3 -2 5

1. Use the sum function to add all of the entries in matrix M.

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Summation = sum(sum(M))

Summation =

17

1. Use the sum function to determine the sum of each column.

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Summation = sum(M)

Summation =

12 0 2 3

1. Use the sum function to determine the sum of each row.

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Summation = sum(M,2)

Summation =

8

-3

14

-2

1. Use the sum function to determine how many entries in M are equivalent to -2.

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Summation = sum(sum(M == -2))

Summation =

4

1. Use the sum function to determine how many entries in M are smaller than 6.

**MATLAB Command and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

Summation = sum(sum(M < 6))

Summation =

14

**Problem 3: (Find function)**

Create the following vector in MATLAB:

V = [ 2 -10 0 4 -2 7 -1 3 -6 9 ]

1. Use the find command to replace all values in vector V that are smaller than 7 and greater than or equal to 2 with 500.

**MATLAB Command and Results:**

clear;clc;

V = [2 -10 0 4 -2 7 -1 3 -6 9];

LessSev = find(V<7 & V>=2)

V(LessSev) = 500

V =

500 -10 0 500 -2 7 -1 500 -6 9

Create the following matrix in MATLAB (same as Problem 1 and 2):

M = 3 6 1 -2

3 0 -2 -4

8 -3 5 4

-2 -3 -2 5

1. Run the command [row col]= find(M==-2) and paste the results below:

**Results:**

row =

4

2

4

1

col =

1

3

3

4

1. Now run the command n = find(M==-2)and paste the results below:

**Results:**

**n =**

**4**

**10**

**12**

**13**

***Note: rather than getting the row and column values where the entry is equivalent to -3, we are getting a single value. It is possible in MATLAB to single index into a matrix which can sometimes greatly simplify a problem. For single indexing, entry numbers simply go down the columns starting with row1 and column1. So, for our matrix, M, entries 1 through 4 sit in column 1, entries 5 through 8 sit in column 2, entries 9 through 12 sit in column 3 and entries 13 through 16 sit in column 4.***

1. Now run the following commands and paste the results below:

A = M; n = find(A==-2); A(n) = 42

**Results:**

**A =**

**3 6 1 42**

**3 0 42 -4**

**8 -3 5 4**

**42 -3 42 5**

1. Create a new matrix B = M. Use the find command to locate all of the negative entries in M and replace them with 0. Paste your commands and results in the space indicated below.

**MATLAB Commands and Results:**

clear;clc;

M = [3 6 1 -2; 3 0 -2 -4; 8 -3 5 4; -2 -3 -2 5];

A = M;

n = find(A == -2);

A(n) = 42;

B = M;

m = find(B < 0);

B(m) = 0

B =

3 6 1 0

3 0 0 0

8 0 5 4

0 0 0 5

**Problem 4: (Sum function and Relational Operators)**

For the problem, you will need to download the HW9.mat file. At the MATLAB command prompt, type the following:

>> load HW9

You should see a 176x5 matrix called Grades in your MATLAB Workspace. This matrix has the grades from three sections of Engineering Models I (176 students) from last year. The table below shows what is in each column of Grades.

|  |  |
| --- | --- |
| **Column 1** | **Lab Average** |
| **Column 2** | **HW Average** |
| **Column 3** | **Midterm** |
| **Column 4** | **Final Exam** |
| **Column 5** | **Final Course Average** |

1. Use the ***sum*** function to count the number of students with a final average greater than or equal to 90.

**MATLAB Commands and Results:**

clear;clc;

load HW9

NineUp = sum(Grades(:,4)>=90)

NineUp =

68

1. Use the ***sum*** function to count the number of students that scored 90 and above on the midterm and on the final exam.

**MATLAB Commands and Results:**

clear;clc;

load HW9

NineUp = sum(Grades(:,4)>=90 & Grades(:,3)>=90)

NineUp =

47

1. Use the ***sum*** function to count the number of students with a homework average below 70.

**MATLAB Commands and Results:**

clear;clc;

load HW9

SevenBelow = sum(Grades(:,2)< 70)

SevenBelow =

21

1. Use the ***sum*** function to count the number of students with lab averages greater than or equal to 80 but less than 90.

**MATLAB Commands and Results:**

clear;clc;

load HW9

BetweenUp = sum(Grades(:,1)>= 80 & Grades(:,1) < 90)

BetweenUp =

27

1. Use the sum function to count the number of students with lab average, homework average, midterm score, and final exam score all greater than or equal to 90.

**MATLAB Commands and Results:**

clear;clc;

load HW9

NineUp = sum(Grades(:,1) >=90 & Grades(:,2) >= 90 & Grades(:,3) >= 90 & Grades(:,4) >= 90)

NineUp =

42