

Engineering Models I

Homework Assignment #9

Instructions:

Download the HW9.mat file and save it in your current MATLAB directory. At the command prompt, type `>> load HW9`. Look in your workspace window. You should see a 1-d array called *vector* (1x12), and a 2-d array called *matrix* (10x5).

Don't change the values in *vector* or *matrix*. If you do inadvertently change them, just re-run the command `>> load HW9` to recover the original arrays.

Problem 1: Useful Array Functions (max, min, and sum)

This problem refers to the arrays *vector* and *matrix*, loaded from the HW9.mat file. Again, don't overwrite the values in the arrays *vector* and *matrix*. If you do, re-load HW9.mat.

Execute the following commands first so you know what *vector* and *matrix* look like.

```
>> vector  
>> matrix
```

- (a) What does the command: `Max = max(vector)` do? **Show the result and explain the result in words.**
- (b) What does the command: `[Max Loc] = max(vector)` do? **Show the result and explain the result in words.**
- (c) What does the command: `Max = max(matrix)` do? **Show the result and explain the result in words.**
- (d) What does the command: `[Max Loc] = max(matrix)` do? **Show the result and explain the result in words.**
- (e) What does the command: `Max = max(matrix, [], 2)` do? **Show the result and explain the result in words.**
- (f) What does the command: `Max = max(max(matrix))` do? **Show the result and explain the result in words.**
- (g) What does the command: `Total = sum(vector)` do? **Show the result and explain the result in words.**

- (h) What does the command: `Total = sum(vector(4:10))` do? **Show the result and explain the result in words.**
- (i) What does the command: `Total = sum(matrix)` do? **Show the result and explain the result in words.**
- (j) What does the command: `Total = sum(matrix,2)` do? **Show the result and explain the result in words.**
- (k) What does the command: `Total = sum(sum(matrix))` do? **Show the result and explain the result in words.**
- (l) What does the command: `Total = sum(matrix(3:6,4))` do? **Show the result and explain the result in words.**

Problem 2: Arrays, Relational Operators, and Useful functions (sum and find)

This problem refers to the array *vector* loaded from the HW9.mat file. Again, don't overwrite the values in the array *vector*. If you do, re-load HW9.mat. **For each of these commands, show the result and explain the result in words.**

- (a) `sum(vector > 0)`
- (b) `sum(vector > 0 & vector < 2)`
- (c) `sum(vector(1:6)==4)`
- (d) `location = find(vector ==0)`
- (e) `location = find(vector > 0 & vector < 4)`
- (f) `location = find(vector == -4); vector(location) = 173`

Problem 3: Arithmetic Operations with Arrays

Determine whether or not the following matrix operations are allowable or not. If the operation is not allowable, indicate this. Otherwise, perform the matrix operations first by hand. Then perform the operations in MATLAB to check your results.

$$(a) \quad \begin{bmatrix} -2 & 3 & 8 \\ 5 & 4 & 3 \\ 4 & 5 & 2 \end{bmatrix} + \begin{bmatrix} 1 & -2 & 10 \\ 5 & -6 & 3 \\ 13 & 7 & 8 \end{bmatrix}$$

$$(b) \quad \begin{bmatrix} -2 & 3 & 8 \\ 5 & 4 & 3 \\ 4 & 5 & 2 \end{bmatrix} - \begin{bmatrix} 1 & -2 & 10 \\ 5 & -6 & 3 \\ 13 & 7 & 8 \end{bmatrix}$$

$$(c) \quad \begin{bmatrix} 2 \\ -1 \end{bmatrix} \times [3 \quad 7 \quad 6]$$

$$(d) \quad \begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix} \times \begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix}$$

$$(e) \quad \begin{bmatrix} 0 & -2 \\ 4 & 3 \end{bmatrix} \times \begin{bmatrix} 3 & 2 & 0 \\ 6 & -3 & 5 \end{bmatrix}$$

Problem 4: Using strcmp and sum

(a) Enter the following commands into MATLAB. Show and explain the results.

```
>> Resp = { 'Yes', 'No', 'Yes', 'No', 'No', 'No', 'Yes' }
```

```
>> sum(strcmp(Resp, 'Yes'))
```

```
>> sum(strcmp(Resp, 'No'))
```

Problem 5: Saving Results from Iterative Equations in an Array

Modify your script file from Assignment #7 Problem 2 to save all of the estimates in an array then plot the estimates. Note: x-axis values will simply be 1:length(estimate).

Hint: You will need to use indexing to create an array of estimates rather than over-writing the old estimate each time thru the loop – something like this:

$$Estimate(k + 1) = \frac{1}{3} (2 * Estimate(k) + Number / Estimate(k)^2)$$

Run your script for the following four test cases and provide the resulting plot of the estimates for each case. **Include your script with your homework submission.**

Number	Estimate
29.85	1
-216	1
2000000	1
2000000	20