MAT 343 MATLAB Assignment # 1

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NOTES FINISH ANSWERS WITH ...

Question 1

```
A=[1 -1 2;3 4 1; 1 -6 4]
B=[0.2 0.5 1.0;3.1 0.8 2.0;3.6 4.1 2.2]
C=[1 2;3 -1; -2 3]

A =
     1    -1     2
     3     4     1
     1    -6     4
B =
    0.2000    0.5000    1.0000
    3.1000    0.8000    2.0000
    3.6000    4.1000    2.2000
C =
     1     2
     3    -1
    -2     3
```

(i) A+B:

```
A+B

ans =
    1.2000   -0.5000    3.0000
    6.1000    4.8000    3.0000
    4.6000   -1.9000    6.2000
```

(ii) B+A:

```
B+A

ans =
    1.2000   -0.5000    3.0000
    6.1000    4.8000    3.0000
    4.6000   -1.9000    6.2000
```

(iii) A+C: A+C

It's undefined b/c they don't have the same dimensions

(iv) 1+C:

```
1+C
```

```
ans =
     2     3
     4     0
    -1     4
```

(v) AB:

```
A*B
```

```
ans =
    4.3000    7.9000    3.4000
   16.6000    8.8000   13.2000
   -4.0000   12.1000   -2.2000
```

(vi) BA:

```
B*A
```

```
ans =
    2.7000   -4.2000    4.9000
    7.5000  -11.9000   15.0000
   18.1000   -0.4000   20.1000
```

(vii) AC: C*A;

It's undefined because the number of cols don't match the number of rows in the second matrix.

(viii) CA:

It's undefined because the number of cols don't match the number of rows in the second matrix.

(ix) 2(A+B):

```
2*(A+B)
```

```
ans =
    2.4000   -1.0000    6.0000
   12.2000    9.6000    6.0000
    9.2000   -3.8000   12.4000
```

(x) 2A+2B:

```
(2*A)+(2*B)
```

```
ans =
    2.4000   -1.0000    6.0000
   12.2000    9.6000    6.0000
    9.2000   -3.8000   12.4000
```

(a) Did MATLAB refuse to do any of the requested calculations? If so, which ones and why?

Answer: Yes, it refused iii,vii,viii because as explained they didn't have the correct dimension where if you multi you need (1x3)(3x4) where the inside terms have to match or when you add they have to have the same dimensions.

(1.b) Does A + B = B + A?

Yes.

(1.c) Does AB = BA?

No.

(1.d) What did 1 + C do?

Added one to each component of the matrix.

(1.e) Does 2(A + B) = 2A + 2B?

Yes.

Question 2

```
A=[0 1;0 0]
B=[1 2; -3 -6]
C=[4 -2; -2 1]
```

```
A =
     0     1
     0     0
B =
     1     2
    -3    -6
C =
     4    -2
    -2     1
```

(i) If BC = 0, then B = 0 or C = 0

Yes, the above expression is correct.

(ii) If A2 = 0, then A = 0:

Yes the above is correct.

(iii) (A + B) 2 = A2 + 2AB + B2:

No.

```
(A+B)^2
(A^2)+(2*A*B)+(B^2)
```

```
ans =
    -8   -15
    15    27
ans =
   -11   -22
    15    30
```

(iv) (A - B)(A + B) = A2 - B2:

No.

```
(A-B)*(A+B)
(A^2)-(B^2)

ans =
     2     3
   -15   -27
ans =
     5    10
   -15   -30
```

(v) A(B + C) = AB + AC:

No.

```
A*(B+C)
(A*B)+(A*B)

ans =
    -5    -5
     0     0
ans =
    -6   -12
     0     0
```

(vi) A(B + C) = BA + CA:

No.

```
A*(B+C)
(B*A)+(C*A)

ans =
    -5    -5
     0     0
ans =
     0     5
     0    -5
```

(vii) (AB)^2=A^2B^2:

No

```
(A*B)^2;
(A^2)*(B^2)

ans =
     0     0
     0     0
```

Question 3

```
A=[1 2; 3 4]
```

```
B=[1 2; 2 7]
C=[1 3 1;-1 2 1]
```

```
A =
     1     2
     3     4
B =
     1     2
     2     7
C =
     1     3     1
    -1     2     1
```

(i) B^T

```
B'
```

```
ans =
     1     2
     2     7
```

(ii) AC^T

Can't incorrect dimensions.

three_ii=A*(C');

Can't multi b/c A and C have different dimensions.

(iii) (C^T)A

```
C'*A
```

```
ans =
    -2    -2
     9    14
     4     6
```

(iv) (A^T)^T

```
(A')'
```

```
ans =
     1     2
     3     4
```

(v) (AB)^T

```
(A*B)'
```

```
ans =
     5    11
    16    34
```

(vi) (A^T)(B^T)

```
(A')*(B')
```

```
ans =
     7    23
    10    32
```

(vii) (B^T)(A^T)

```
(B')*(A')
```

```
ans =
     5    11
    16    34
```

(a) Did MATLAB refuse to do any of the requested calculations? If so, which ones and why?

Yes, problem II b/c A and C have different dimensions.

(b) What is the relationship between (AT)T and A?

Same.

```
(A')'
A
```

```
ans =
     1     2
     3     4
A =
     1     2
     3     4
```

(c)Is B symmetric?

No.

(d) Does (AB) T = AT BT? What is the relationship between (AB)T and AT, BT?

No (AB) T = AT BT. ...

```
(A*B)'
(A')*(B')
```

```
ans =
     5    11
    16    34
ans =
     7    23
    10    32
```

Question #4

Generate two 3 × 3 random matrices with integer entries with the commands: R =round(10*rand(3)), S=round(10*rand(3))

```
R =round(10*rand(3)), S=round(10*rand(3))
```

```
R =
     8     4     4
```

```
     8     8     9
     6     5     9
S =
     6     2     2
     6     3     8
     6     5     2
```

(i)[R*S(:,1), R*S(:,2), R*S(:,3)]

```
[R*S(:,1), R*S(:,2), R*S(:,3)]

ans =
    96    48    56
   150    85    98
   120    72    70
```

(ii)[R(1,:)*S; R(2,:)*S; R(3,:)*s]

```
[R(1,:)*S; R(2,:)*S; R(3,:)*S]

ans =
    96    48    56
   150    85    98
   120    72    70
```

(iii)Compare the results of parts (i) and (ii) to the product R*S

They're the same.

```
R*S

ans =
    96    48    56
   150    85    98
   120    72    70
```

(iv)Explain how the matrices in (i) and (ii) are generated.

i: The first row is the product of R and the first col of S.

i: The second row is the product of R and the second col of S.

i: The third row is the product of R and the third col of S.

ii: The first row is the product of S and the first row of R.

ii: The second row is the product of S and the second row of R.

ii: The third row is the product of S and the third row of R.

Question #5

Create matrices with eye, ones, diag and triu Create the following matrices with the help of the matrix generation functions eye , ones, diag and triu. See the on-line help on these functions if required (i.e. help eye)

```
v=[6 6 6]
```

```
M=diag(v)
N=ones(3)*5
N=triu(N)
P=ones(3,2)*7
Q=diag([2 3 4])
```

```
v =
     6     6     6
M =
     6     0     0
     0     6     0
     0     0     6
N =
     5     5     5
     5     5     5
     5     5     5
N =
     5     5     5
     0     5     5
     0     0     5
P =
     7     7
     7     7
     7     7
Q =
     2     0     0
     0     3     0
     0     0     4
```

Question #6

Create a big matrix with submatrices: The following matrix G is created by inserting the matrices A, B, and C from Exercise 3, together with 2×2 zero matrices and 2×2 identity matrices in the appropriate position. Create the matrix using submatrices A, B, C, zeros and eye (that is, you are not allowed to enter the numbers explicitly).

```
A
B
C
Z=zeros(2,3)
v=[1 1]
I=diag(v)
G=[A;I];
R=[I Z;B C];
G=[G R];
```

```
A =
     1     2
     3     4
B =
     1     2
     2     7
C =
     1     3     1
```

```
    -1     2     1
Z =
     0     0     0
     0     0     0
v =
     1     1
I =
     1     0
     0     1
```

Question #7

Manipulate a matrix: Do the following operations on matrix G created above in Problem 6 (a) Extract the first 3×3 submatrix from G and store it in the matrix H, that is, create a matrix

```
H=G(1:3,1:3)
```

```
H =
     1     2     1
     3     4     0
     1     0     1
```

(b)Create the matrix E obtained from H by replacing H22 = 4 by 7. Do not enter E explicitly. Hint: enter first E=H; to create copy of the matrix H and then manipulate the matrix E. The resulting matrix should be

```
E=H
E(2,2)=7
E
```

```
E =
     1     2     1
     3     4     0
     1     0     1
E =
     1     2     1
     3     7     0
     1     0     1
E =
     1     2     1
     3     7     0
     1     0     1
```

(c)Create the matrix F obtained by deleting the third column of the matrix H. Do not enter F explicitly.

```
F=H(1:2,1:3)
```

```
F =
     1     2     1
     3     4     0
```

(d)What happens if you type G(:,:) and hit return? Do not include the output in your lab report, but include a statement describing the output in words. What happens if you type G(:) and hit return? Do not include the output in your lab report, but include a statement describing the output in words.

Outputs the Same Matrix.

(e) What happens if you type G(5,2) and hit return? Explain.

Returns an error because there is no 5th row.

(f) What happens if you type max(G)? Explain. What happens if you type sum(G)? Explain.

max(G) returns the higest value of each Col.sum(G) returns the sum of each col.

(g) What happens if you type G(G>3) and hit return? Can you explain how MATLAB got that answer? What happens if you type G(G>3) = 100 and hit return? Can you explain how MATLAB got that answer?

G(G>3) returns all numbers that are greater than three in the matrix. Matlab calculated that answer by going through each component and testing the condition. If it returned true it return the number. G(G>3)=100 replaces all the numbers that are greater than 3 with 100.

Question #8

Perform row operations: The three elementary row operations can be performed in MATLAB using the following commands Type I: A([i,j],:)=A([j,i],:) interchanges row i and row j Perform row operations in MATLAB that reduce the matrix A to Row Echelon Form.

```
A=[1 3 7;3 -1 4;6 -2 5];
A
A(2,:)=A(2,:)+(-3*A(1,:))
A(3,:)=A(3,:)+(-6*A(1,:))
A(2,:)=A(2,:)+(-11/20*A(3,:))
A(1,:)=A(1,:)+(-3*A(2,:))
A(3,:)=A(3,:)+(20*A(2,:))
```

```
A =
     1     3     7
     3    -1     4
     6    -2     5
A =
     1     3     7
     0   -10   -17
     6    -2     5
A =
     1     3     7
     0   -10   -17
     0   -20   -37
A =
    1.0000    3.0000    7.0000
         0    1.0000    3.3500
         0  -20.0000  -37.0000
A =
    1.0000         0   -3.0500
         0    1.0000    3.3500
         0  -20.0000  -37.0000
A =
    1.0000         0   -3.0500
         0    1.0000    3.3500
         0         0   30.0000
```

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