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% MAT 343 MATLAB Assignment # 1
% Question 1

A = [4 5 -3; 5 2 1; -5 -5 6;]

A =

       4              5             -3
       5              2              1
      -5             -5              6

B = [3.8 3.8 -0.3; -0.2 1.4 1.1; 3.9 3.0 3.6]

B =

      19/5           19/5           -3/10
      -1/5            7/5           11/10
      39/10           3             18/5

C = [2 5 2; -6 6 3]

C =

       2              5              2
      -6              6              3

% i
B+A

ans =

      39/5           44/5          -33/10
      24/5           17/5           21/10
     -11/10          -2             48/5

% ii
4*A + 4*B

ans =

     156/5          176/5          -66/5
      96/5           68/5           42/5
     -22/5           -8            192/5


% iii
3 + C

ans =

       5              8              5
      -3              9              6


% iv
A*B

ans =
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       5/2           66/5          -13/2
      45/2          124/5           43/10
      27/5           -8             88/5

% v
A + C
Arrays have incompatible sizes for this operation.

% vi
C*A

ans =

      23            10             11
      -9           -33             42


% vii
%A*C
A*C

Error using *
Incorrect dimensions for matrix multiplication. Check that the number of columns in
the first
matrix matches the number of rows in the second matrix. To perform elementwise
multiplication, use '.*'.

% viii
A + B

ans =

      39/5           44/5          -33/10
      24/5           17/5           21/10
     -11/10          -2             48/5


% ix
B*A

ans =

     357/10         281/10          -47/5
       7/10         -37/10           43/5
      63/5           15/2          129/10


% x
4*(A + B)

ans =

     156/5          176/5          -66/5
      96/5           68/5           42/5
     -22/5           -8            192/5

% Question 1(a)
% v and vii did not execute because the dimensions were incompatible
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% Question 1(b)
if (A*B) == (B*A)
        disp("question 1b true")
else
        disp("question 1b false")
end
question 1b false
% no, AB does not equal BA

% Question 1(c)
if (A + B) == (B+ A)
        disp("question 1c true")
else
        disp("question 1c false")
end
question 1c true
% Yes, A+B = B+A

% Question 1(d)
% 3 was added to every element of C

% Question 1(e)
if 4*(A + B) == 4*(A+ B)
        disp("question 1e true")
else
        disp("question 1e false")
end
question 1e true
% Yes, 4(A+B) = 4A+4B

% Question 2
A = [-3 9; -1 3]

A =

      -3              9
      -1              3

B = [2 4; 3 6]

B =

       2              4
       3              6

C = [-2 -6; 1 3]

C =

      -2             -6
       1              3

% i
if A*A == zeros(2)
        disp("question 2i true")
else
        disp("question 2i false")
end
question 2i true
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% ii
if (A-B)*(A+B) == (A*A)-(B*B)
        disp("question 2ii true")
else
        disp("question 2ii false")
end
question 2ii false

% iii
if A*(B+C) == A*B + A*C
        disp("question 2iii true")
else
        disp("question 2iii false")
end
question 2iii true

% iv
if B*C == zeros(2)
        disp("question 2iv true")
else
        disp("question 2iv false")
end
question 2iv true

% v
if A*(B+C) == B*A + C*A
        disp("question 2v true")
else
        disp("question 2v false")
end
question 2v false

% vi
if (A+B) * (A+B) == A*A + 2*A*B + B*B
        disp("question 2vi true")
else
        disp("question 2vi false")
end
question 2vi false

% vii
if (A*B)*(A*B) == (A*A)*(B*B)
        disp("question 2vii true")
else
        disp("question 2vii false")
end
question 2vii false

% Question 3

A = [6 -5; 1 -5]

A =

       6            -5
       1            -5

B = [-3 4; 4 4]
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B =

      -3              4
       4              4

C = [-3 -2 -3; 6 -4 2]

C =

      -3             -2             -3
       6             -4              2

% i
A'*B'

ans =

     -14             28
      -5            -40

% ii
A*C'
Error using *
Incorrect dimensions for matrix multiplication. Check that the number of columns in
the first matrix matches the number of rows
in the second matrix. To perform elementwise multiplication, use '.*'.

% iii
B'

ans =

      -3              4
       4              4

% iv
(A*B)'

ans =

     -38            -23
       4            -16

% v
(A')'

ans =

       6             -5
       1             -5

% vi
C'*A

ans =

     -12            -15
     -16             30
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     -16              5

% vii
A'*B'

ans =

     -14             28
      -5            -40

% Question 3(a)
% Matlab did not excute ii because its dimensions are incompatible.

% Question 3(b)
if (A*B)' == A'*B'
        disp("Question 3(b) Yes, (AB)^T is equal to A^T*B^T")
else
        disp("Question 3(b) No, (AB)^T does not equal A^T*B^T")
end
Question 3(b) No, (AB)^T does not equal A^T*B^T

if (A*B)' == B'*A'
        disp("Question 3(b) Yes, (AB)^T is equal to B^T*A^T")
else
        disp("Question 3(b) No, (AB)^T does not equal B^T*A^T")
end
Question 3(b) Yes, (AB)^T is equal to B^T*A^T

% Question 3(c)
if B == B'
        disp("Yes, B is symmetric. A matrix is symmetric when the matrix is
equivalent to its transpose")
else
        disp("No, B is not symmetric. A matrix is symmetric when the matrix is
equivalent to its transpose")
end
Yes, B is symmetric. A matrix is symmetric when the matrix is equivalent to its
transpose

% Question 3(d)
% The outer transpose reverses the change the inner transpose. (A^T)^T is equal to
A.

% Question 4

R = round(10*rand(3))

R =

       8              0              7
      10              8              8
       7              9              7

S = round(10*rand(3))

S =

       4              7              0
       7              0              1
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       2             3             8

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

ans =

      46            77            56
     112            94            72
     105            70            65


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

ans =

      46            77            56
     112            94            72
     105            70            65

% iii
R*S

ans =

      46            77            56
     112            94            72
     105            70            65


% The product of R*S is equivalent to the matrices of i and ii

% iv
% i uses matrix column vector multiplication (right) vs ii uses row matrix
multiplication (left)

% Question 5

M = triu(9*ones(3))

M =

       9             9             9
       0             9             9
       0             0             9

N = diag([6 6 6])

N =

       6             0             0
       0             6             0
       0             0             6

P = diag([7 8 9])

P =
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```
       7             0             0
       0             8             0
       0             0             9

Q = 5*ones(3, 2)

Q =

       5             5
       5             5
       5             5

% Question 6

G = zeros(4, 7) + eye(4, 7);
G(3:4,1:2) = A

G =

       1             0             0             0             0             0
0
       0             1             0             0             0             0
0
       6            -5             1             0             0             0
0
       1            -5             0             1             0             0
0

G(1:2,3:4) = B

G =

       1             0            -3             4             0             0
0
       0             1             4             4             0             0
0
       6            -5             1             0             0             0
0
       1            -5             0             1             0             0
0

G(1:2,5:7) = C

G =

       1             0            -3             4            -3            -2
-3
       0             1             4             4             6            -4
2
       6            -5             1             0             0             0
0
       1            -5             0             1             0             0
0

% Question 7(a)
H = G(1:3,5:7)

H =
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      -3            -2            -3
       6            -4             2
       0             0             0


% Question 7(b)
E = H;
E(1,2) = 2*E(1,2)

E =

      -3            -4            -3
       6            -4             2
       0             0             0


% Question 7(c)

F = zeros(2,3)

F =

       0             0             0
       0             0             0

F(1,:) = H(1,:)

F =

      -3            -2            -3
       0             0             0

F(2,:) = H(2,:)

F =

      -3            -2            -3
       6            -4             2

% Question 7(d)

% It return all rows and columns of G

% Question 7(e)
% There is an error because G has 4 rows. There is no row 7.

% Question 7(f)
max(G)

ans =

  Columns 1 through 6

       6             1             4             4             6             0

  Column 7

       2
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% Max returns a row vector with the maximum value of each column in G

% Question 7(g)
G(G>3)

ans =

       6
       4
       4
       4
       6

% This reutrns all elements in G greater than 3 as a column vector.

G(G>3) = 300

G =

  Columns 1 through 6

       1              0             -3            300             -3             -2
       0              1            300            300            300             -4
     300             -5              1              0              0              0
       1             -5              0              1              0              0

  Column 7

      -3
       2
       0
       0

% This replaces all elements greater than 3 with 300.

% Question 8

format rat
A = [3 5 4;-12 -23 -14;6 4 14]

A =

       3              5             4
     -12            -23           -14
       6              4            14

A(2,:) = A(2,:) + 4*A(1,:)

A =

       3              5             4
       0             -3             2
       6              4            14

A(3,:) = A(3,:) - 2*A(1,:)

A =

       3              5             4
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```
       0             -3              2
       0             -6              6

A(3,:) = A(3,:) - 2*A(2,:)

A =

       3              5              4
       0             -3              2
       0              0              2

A(1,:) = 1/3*A(1,:)

A =

       1              5/3            4/3
       0             -3              2
       0              0              2

A(2,:) = -1/3*A(2,:)

A =

       1              5/3            4/3
       0              1             -2/3
       0              0              2

A(3,:) = 1/2*A(3,:)

A =

       1              5/3            4/3
       0              1             -2/3
       0              0              1

A(1,:) = A(1,:) - 5/3*A(2,:)

A =

       1              *             22/9
       0              1             -2/3
       0              0              1

A(1,:) = A(1,:) - 22/9*A(3,:)

A =

       1              *              0
       0              1             -2/3
       0              0              1

A(2,:) = A(2,:) + 2/3*A(3,:)

A =

       1              *              0
       0              1              0
       0              0              1
```

diary off