MATLAB Assignment 2

Graded

Student

Miles Levine

View or edit group

Total Points

58 / 62 pts

Question 1

1 **14** / 14 pts

✔ **+ 14 pts** Correct

+ 4 pts (a)

+ 4 pts (b)

+ 4 pts (c)

+ 2 pts (d)

− 7 pts No output

Question 2

2 **12** / 12 pts

✔ **− 0 pts** Correct

Question 3

3 8 / 12 pts

− 0 pts Correct

− 1 pt Numerical calculation error, all kinds.
See annotations for which number(s) were wrong.

− 1 pt Typo defining the matrix.

− 2 pts Part (d) minor mistake.

✔ **− 4 pts** Part (d) major mistake.

1 det(B) missing. Final numerical answer missing.

− 6 pts Part (d) missing/incorrect.

Question 4

4 **14** / 14 pts

✔ **+ 14 pts** Correct

− 4 pts Part c is incorrect / missing

Question 5

5 **10** / 10 pts

− 0 pts One recommended answer for 5c is as follows:
We know that when comparing the solutions of $p(x) = 0$ versus $p^k(x) = 0$, the values of the solutions remain unchanged. The multiplicities of the solutions are scaled by a factor of k.
Thus to solve $\det(A^k) = [\det(A)]^k = 0$, we get the same values as the solutions to $\det(A) = 0$, which are $x = \frac{-3}{2}, x = \frac{-1}{7}, \text{ and } x = 0$

Remark: A reason like $[\det(A) = 0$ implies $\det(A^k) = 0$ so the answer for 5c is the same as 5b] is NOT sufficient. You only showed the values in 5b work, you FAIL to show why these are the only values that work.

✔ **− 0 pts** Correct.
As long as your values for 5c were correct, any reasons for 5c were given full credits.
See above for a sample answer for 5c.

− 6 pts Part c incorrect/missing.

− 2 pts Major coding mistake.

− 1 pt Typo when defining the A matrix.

− 1 pt Minor mistake. See annotations.

Question assigned to the following page: 1

Contents


```
%Miles Levine
%Section 0412
%Matlab Project 2
```

Problem 1

```
%%a
format short;
x = pi/6;
A = [cos(x), -sin(x); sin(x), cos(x)];
disp("matrix A:");
disp(A);
A = [cos(x), -sin(x); sin(x), cos(x)];
disp("Multiply column 1 by 2, and colum 2 by 5.");
A(:,1) = 2*A(:,1);
A(:,2) = 5*A(:,2);
disp("matrix A scaled:");
disp(A);
%%b
disp("matrix B:");
B = [1, 0; 0, 1];
disp(B);
disp("scale y by factor of 7");
B(:,2) = 7*B(:,2);
disp(B);
disp("Multiply column 1 by 2, and colum 2 by 5.");
B(:,1) = 2*B(:,1);
B(:,2) = 5*B(:,2);
disp(B);
%%c
C = A*B;
D = B*A;
disp("A multiplied by B");
disp(C);
disp("B multiplied by A");
disp(D);
%%d
disp("When applying multiple transformations to a point, the commutative");
disp("property states that the final result can be different depending on ");
disp("the order in which you apply the transformations");
disp(" ");
```

```
matrix A:
    0.8660   -0.5000
```

Questions assigned to the following page: 1 and 2

```
    0.5000    0.8660

Multiply column 1 by 2, and colum 2 by 5.
matrix A scaled:
    1.7321   -2.5000
    1.0000    4.3301

matrix B:
     1     0
     0     1

scale y by factor of 7
     1     0
     0     7

Multiply column 1 by 2, and colum 2 by 5.
     2     0
     0    35

A multiplied by B
    3.4641  -87.5000
    2.0000  151.5544

B multiplied by A
    3.4641   -5.0000
   35.0000  151.5544

When applying multiple transformations to a point, the commutative
property states that the final result can be different depending on
the order in which you apply the transformations
```

Problem 2

```
disp("Problem 2");
%%a
format rat;
A = [1, 2, -1; 2, 1, 2; -3, 2, 1];
disp("coefficient matrix A:");
disp(A);
disp("inverse of A:");
inverseA = inv(A);
disp(inverseA);
%%b
disp("matrix B is the right hand side of the system of equation")
B = [13; 5; 6];
disp(B);
disp("Multipling B by the inverse of A yields the unique solution to the");
    disp(" system of equations: x1, x2, x3 ");
X = inverseA * B;
disp(X);
%%c
disp("To find the inverse of matrix A, construct the augmented matrix");
disp(" with identity matrix size 3x3:");
X=[A eye(3)];
disp(X);
disp("rref of new augmented matrix X is:");
```

Question assigned to the following page: 2

```
Y = rref(X);
disp(Y);
%%d
disp("now we extract the last 3 columns of the  6x6 matrix Y:");
inverseA = Y(:, 4:6);
disp(inverseA);
```

```
Problem 2
coefficient matrix A:
       1              2              -1
       2              1               2
      -3              2               1

inverse of A:
       3/26           2/13           -5/26
       4/13           1/13            2/13
      -7/26           4/13            3/26

matrix B is the right hand side of the system of equation
      13
       5
       6

Multipling B by the inverse of A yields the unique solution to the
 system of equations: x1, x2, x3
      29/26
      69/13
     -33/26

To find the inverse of matrix A, construct the augmented matrix
 with identity matrix size 3x3:
  Columns 1 through 5

       1              2              -1              1              0
       2              1               2              0              1
      -3              2               1              0              0

  Column 6

       0
       0
       1

rref of new augmented matrix X is:
  Columns 1 through 5

       1              0              0              3/26           2/13
       0              1              0              4/13           1/13
       0              0              1             -7/26           4/13

  Column 6

      -5/26
       2/13
       3/26

now we extract the last 3 columns of the  6x6 matrix Y:
```

Questions assigned to the following page: 3 and 2

```
    3/26           2/13           -5/26
    4/13           1/13            2/13
   -7/26           4/13            3/26
```

Problem 3

```
disp(" ");
disp("Problem 3");
format rat;
%%a
disp("Matrix A:")
A = [0 0 1 -1 0 1; -2 6 -1 1 4 3; 0 4 -1 1 2 1; -2 4 1 1 2 3; 2 -4 0 0 -2 -2; 0 2 -1 1 2 -1];
disp(A);
%%b
disp("determinant of A:");
detA = det(A);
disp(detA);
disp("To get the determinant of A inverse, you need to reciprocate the");
disp(" determinant of A to get 1/det(A).");
disp("So the determinant of A inverse = 1/det(A)");
detAInverse = 1/detA;
disp(" ");
%%d

disp("The det((A)^-2)(B^2)) is equal to (det(A)^-2) * (det(B)^2)");
disp("You can rewrite it to be (det(B)^2)/(det(A)^2)");
disp("The det(A^Z) is equal to the det(A) raised to Z in ");
disp("which Z is any integer");
```

```
Problem 3
Matrix A:
  Columns 1 through 5

       0              0              1             -1              0
      -2              6             -1              1              4
       0              4             -1              1              2
      -2              4              1              1              2
       2             -4              0              0             -2
       0              2             -1              1              2

  Column 6

       1
       3
       1
       3
      -2
      -1

determinant of A:
      32

To get the determinant of A inverse, you need to reciprocate the
```

Questions assigned to the following page: 3 and 4

```
 determinant of A to get 1/det(A).
So the determinant of A inverse = 1/det(A)

The det((A)^-2)(B^2)) is equal to (det(A)^-2) * (det(B)^2)
You can rewrite it to be (det(B)^2)/(det(A)^2)
The det(A^Z) is equal to the det(A) raised to Z in
which Z is any integer
```

Problem 4

```
disp(" ");
disp("Problem 4:");
%%a
A = [1, 4, 5; 2, 5, 6; 5, 7, 5];
B = [-3, -6, 9; 3, -5, 3; 4, 6, 3];
disp("A:")
disp(A);
disp("B:")
disp(B);
X = (A*B)^2;
Y = (A^2)*(B^2);
disp("(AB)^2:")
disp(X);
disp("(A^2)*(B^2):")
disp(Y);
%%b
C = [1, 1, 1; 1, 1, 1; 1, 1, 1];
D = [2, 2, 2; 2, 2, 2; 2, 2, 2];
disp("C:");
disp(C);
disp("D:");
disp(D);

X = (C*D)^2;
Y = (C^2)*(D^2);

disp("(CD)^2:")
disp(X);
disp("(C^2)*(D^2):")
disp(Y);
%%c
disp("Yes, it is possible that A and B are both invertable although A+B");
disp("may not be invertable");
disp("matrix A:");
A = [-3 5; -6 2];
disp(A);
disp("matrix B");
B = [3 -4; 6, 7];
disp(B);
disp("The det(A) = ");
P = det(A);
disp(P);
disp("The det(B) = ");
X = det(B);
disp(X);
disp("A+B = new matrix C");
C = A+B;
```

Question assigned to the following page: 4

```
disp(C);
disp("The det(C) = ");
detC = det(C);
disp(detC);
disp("This proves that A and B are both invertable but A+B isnt.");
disp("Since the determinants of A and B are not equal to zero, they can ");
disp("be inverted, but in this case the determinant of A+B does equal 0 ");
disp("so A+B cannot be inverted.");
```

```
Problem 4:
A:
       1             4             5
       2             5             6
       5             7             5

B:
      -3            -6             9
       3            -5             3
       4             6             3

(AB)^2:
    1909         -1148          4164
    2250         -1652          5268
    1705         -2696          5712

(A^2)*(B^2):
    1182          2999          4029
    1494          3639          5229
    1764          3426          6894

C:
       1             1             1
       1             1             1
       1             1             1

D:
       2             2             2
       2             2             2
       2             2             2

(CD)^2:
     108           108           108
     108           108           108
     108           108           108

(C^2)*(D^2):
     108           108           108
     108           108           108
     108           108           108

Yes, it is possible that A and B are both invertable although A+B
may not be invertable
matrix A:
      -3             5
      -6             2
```

Questions assigned to the following page: 4 and 5

```
matrix B
       3             -4
       6              7

The det(A) =
      24

The det(B) =
      45

A+B = new matrix C
       0              1
       0              9

The det(C) =
       0

This proves that A and B are both invertable but A+B isnt.
Since the determinants of A and B are not equal to zero, they can
be inverted, but in this case the determinant of A+B does equal 0
so A+B cannot be inverted.
```

Problem 5

```
disp(" ");
disp("Problem 5");
format rat;
%%a
syms x;
A = [2*x, x+2, x; -x-1, x, 3*x; -2*x, x+1, -x];
disp(A);
%%b
detA = det(A);
x = solve(detA == 0,x);
disp(x);
%%c
disp("The values x would be the same as part b because when we solve ");
disp("for det(A)^k = 0 versus det(A) = 0 the multiplicities of the roots ");
disp("changed values but the actual values of the root did not.");
disp("x values for wich A^k does not have an inverse:");
disp(x);
```

```
Problem 5
[    2*x, x + 2,   x]
[- x - 1,     x, 3*x]
[   -2*x, x + 1,  -x]

-3/2
-1/7
   0

The values x would be the same as part b because when we solve
for det(A)^k = 0 versus det(A) = 0 the multiplicities of the roots
changed values but the actual values of the root did not.
```

Question assigned to the following page: 5

```
x values for wich A^k does not have an inverse:
-3/2
-1/7
   0
```