MATLAB Assignment 1

Graded

Student

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View or edit group

Total Points

63 / 72 pts

Question 1

1 **20** / 20 pts

- ✔ **+ 20 pts** Correct
- **+ 4 pts** Part a correct
- **+ 10 pts** Part b correct
- **+ 2 pts** Part c correct
- **+ 4 pts** Part d correct
- **− 1 pt** Minor mistakes
- **− 4 pts** No outputs for matrices
- **− 10 pts** Part b missing
- **− 4 pts** Part d is incorrect

Question 2

2 **8 / 14 pts**

- **– 0 pts** Correct

- **– 1 pt** Fail to “provide an explicit vector (with numbers) that is not in the span of T”

- **– 4 pts** The A matrix should be $\begin{bmatrix} -60 & 350 & a \\ 275 & 400 & b \end{bmatrix}$, with 2 given vectors being colomns.

- **– 1 pt** Typo defining your augmented matrix, see annotations.

- **– 3 pts** Should leave a, b as symbolic variable, cannot define a or b as some random chosen numbers.

- **– 2 pts** Issue in explaination, see annotations.

- ✔ **– 6 pts** Part d) incorrect. You need to find a vector w such that NOT all 2 dimensional vector is in span of T

  1 Does not work.

- **– 2 pts** Part c): what are your weights c_1, c_2?

- **– 1 pt** Typo in some parts of your codes, see annotations.

- **– 1 pt** See annotations.

- **– 3 pts** See annotations.

- **– 14 pts** Incorrect.

Question 3

3 **9 / 9 pts**

- ✔ **– 0 pts** Correct: Defined A as $\begin{bmatrix} \mathbf{v_1} & \mathbf{v_2} & \mathbf{v_3} & \mathbf{v_4} & \mathbf{0} \end{bmatrix}$, the rref reveals if the vectors forms a coefficient matrix, C, then $C\mathbf{x} = \mathbf{0}$ have only the trivial solutions.
  One possible rigorous answer would be "The vectors given are linearly independent, since the zero vector is the unique solution of $\begin{bmatrix} \mathbf{v_1} & \mathbf{v_2} & \mathbf{v_3} & \mathbf{v_4} \end{bmatrix} \mathbf{x} = \mathbf{0}$*"*

- **– 0 pts** Correct: Defined A as $\begin{bmatrix} \mathbf{v_1} & \mathbf{v_2} & \mathbf{v_3} & \mathbf{v_4} \end{bmatrix}$, the rref reveals all columns have a pivot.

- **– 4 pts** **A pivot in every row** is the condition for columns of A spans the Euclidean space where columns of A belongs to, it has nothing to do with the concept of linear (in)dependence of columns!

- **– 2 pts** Insufficient explaination, see sample answers above.

- **– 2 pts** Coding mistake/typo/wrong conclusion. See annotations.

- **– 4 pts** Each vector needs to be a column in your matrix A. Put as a row costs all points off your part (a).

- **– 4 pts** Incorrect explaination, see sample answers above.

- **– 4 pts** Incorrect matrix A defined.

- **– 9 pts** Incorrect.

Question 4

4 **6** / 9 pts

- **– 0 pts** Correct
- **– 4 pts** (a) incorrect/missing
- **– 5 pts** (b) incorrect/missing
- ✔ **– 3 pts** You need to give two different linear combinations
- **– 2 pts** Your linear combinations are incorrect.
- **– 3 pts** No output

Question 5

5 **20** / 20 pts

- ✔ **– 0 pts** Correct
- **– 5 pts** (f) missing/incorrect
- **– 3 pts** (e) incorrect/missing
- **– 3 pts** (b) incorrect

Question assigned to the following page: 1

Contents


```
%Miles Levine
%Section 0412
%Matlab Project 1
```

Problem 1

```
%%a
format rat;
A=[1 -5 -3 -8 -5; 1 6 3 25 14; -1 4 -3 5 -3; 3 -2 -3 15 6];
disp(A);
%%b
disp("First step: Multiply row 1 by -1, then add it to row 2.");
disp(" Add row 1 to row 3. Multiply row 1 by -3, then add it to row 4.");
A(2,:) = -1*A(1,:) + A(2,:);
A(3,:) = A(1,:) + A(3,:);
A(4,:) = -3*A(1,:) + A(4,:);

disp(A);
disp("2nd step: Multiply row 2 by 1/11, then add it to row 3.");
disp(" Multiply row 2 by -13/11, then add it to row 4.");
A(3,:) = (1/11)*A(2,:) + A(3,:);
A(4,:) = (-13/11)*A(2,:) + A(4,:);
disp(A);
disp("3rd step: Multiply row 3 by -1/5, then add it to row 4.");
A(4,:) = A(3,:)*(-.2) + A(4,:);
disp(A);
disp("Matrix is now in REF, now solve for RREF");
disp("4th step: Scale row 2 by mutiplying row by 1/11. Scale row");
    disp(" 3 by mutiplying row by -11/60. Scale row 4 by mutiplying row by -5.");
A(2,:) = A(2,:)*(1/11);
A(3,:) = A(3,:)*(-11/60);
A(4,:) = A(4,:)*(-5);
disp(A);
disp("5th step: kill -5 in row 1 by multiplying row 2 by 5, then adding into row 1");
A(1,:) = 5*A(2,:)+A(1,:);
disp(A);
disp("6th step: kill -3/11 in row 1 by multiplying row 3 by 3/11, then");
    disp("adding into row 1. Also kill 6/11 in row 2 ");
    disp("by multiplying row 3 by -6/11, then adding into row 2");
A(1,:) = (3/11)*A(3,:)+A(1,:);
A(2,:) = (-6/11)*A(3,:)+A(2,:);
disp(A);
disp("7th step (final): kill 79/20 in row 1 by multiplying row 4 by");
disp(" -79/20, then adding into row 1. Also kill 11/10 in row 2 by ");
disp("multiplying row 4 by -11/10, then adding into row 2. Also kill ");
```

```
disp("23/20 in row 3 by multiplying row 4 by -23/20, then adding into row 3");
A(1,:) = (-79/20)*A(4,:)+A(1,:);
A(2,:) = (-11/10)*A(4,:)+A(2,:);
A(3,:) = (-23/20)*A(4,:)+A(3,:);

disp(A);
%%c
disp("using rref command:")
B=[1 -5 -3 -8 -5; 1 6 3 25 14; -1 4 -3 5 -3; 3 -2 -3 15 6];
X= rref(B);
disp(X);
%%d
disp("system has no solutions because it is inconsistant")
disp("");
disp("");
```

```
       1             -5             -3             -8             -5
       1              6              3             25             14
      -1              4             -3              5             -3
       3             -2             -3             15              6

First step: Multiply row 1 by -1, then add it to row 2.
 Add row 1 to row 3. Multiply row 1 by -3, then add it to row 4.
       1             -5             -3             -8             -5
       0             11              6             33             19
       0             -1             -6             -3             -8
       0             13              6             39             21

2nd step: Multiply row 2 by 1/11, then add it to row 3.
 Multiply row 2 by -13/11, then add it to row 4.
       1             -5             -3             -8             -5
       0             11              6             33             19
       0              0            -60/11           0            -69/11
       0              0            -12/11           0            -16/11

3rd step: Multiply row 3 by -1/5, then add it to row 4.
       1             -5             -3             -8             -5
       0             11              6             33             19
       0              0            -60/11           0            -69/11
       0              0              *              0             -1/5

Matrix is now in REF, now solve for RREF
4th step: Scale row 2 by mutiplying row by 1/11. Scale row
 3 by mutiplying row by -11/60. Scale row 4 by mutiplying row by -5.
       1             -5             -3             -8             -5
       0              1              6/11           3             19/11
       0              0              1              0             23/20
       0              0              *              0              1

5th step: kill -5 in row 1 by multiplying row 2 by 5, then adding into row 1
       1              0             -3/11           7             40/11
       0              1              6/11           3             19/11
       0              0              1              0             23/20
       0              0              *              0              1

6th step: kill -3/11 in row 1 by multiplying row 3 by 3/11, then
adding into row 1. Also kill 6/11 in row 2
```

Questions assigned to the following page: 1 and 2

```
by multiplying row 3 by -6/11, then adding into row 2
       1              0              *              7              79/20
       0              1              0              3              11/10
       0              0              1              0              23/20
       0              0              *              0               1

7th step (final): kill 79/20 in row 1 by multiplying row 4 by
 -79/20, then adding into row 1. Also kill 11/10 in row 2 by
multiplying row 4 by -11/10, then adding into row 2. Also kill
23/20 in row 3 by multiplying row 4 by -23/20, then adding into row 3
       1              0              *              7              *
       0              1              *              3              *
       0              0              1              0              *
       0              0              *              0              1

using rref command:
       1              0              0              7              0
       0              1              0              3              0
       0              0              1              0              0
       0              0              0              0              1

system has no solutions because it is inconsistant
```

Problem 2

```
%%a
syms a b
%%b
M = [-60 350 a; 275 400 b];
M_rref = rref(M);
disp(M_rref);
%%c
c1 = M_rref(1,3);
c2 = M_rref(2,3);
disp("Coefficient for c1:");
disp(c1);
disp("Coefficient for c2:");
disp(c2);
%%d
V = [1; 1];
disp("A vector that works for w is ");
disp(V);
disp("w = [1; 1] works because it not a linear combination of the vector");
disp(" [-60; 275]. vector [1; 1] goes in a different direction than ");
disp("[-60; 275] so it is not in the span of T.");
```

```
[1, 0,   (7*b)/2405 - (8*a)/2405]
[0, 1, (11*a)/4810 + (6*b)/12025]

Coefficient for c1:
(7*b)/2405 - (8*a)/2405

Coefficient for c2:
(11*a)/4810 + (6*b)/12025
```

Questions assigned to the following page: 2, 3, and 4

```
A vector that works for w is
       1
       1

w = [1; 1] works because it not a linear combination of the vector
 [-60; 275]. vector [1; 1] goes in a different direction than
[-60; 275] so it is not in the span of T.
```

Problem 3

```
A = [1 4 -4 3 0; 5 -2 5 3 0; 6 5 1 -7 0; 4 -4 5 0 0; 1 1 -1 2 0];
disp(A);
rref_A = rref(A);
disp(rref_A);
disp("Matrix A is linearly independent because ")
disp("the zero vector is the unique solution to Ax=0");
```

```
       1              4             -4              3              0
       5             -2              5              3              0
       6              5              1             -7              0
       4             -4              5              0              0
       1              1             -1              2              0

       1              0              0              0              0
       0              1              0              0              0
       0              0              1              0              0
       0              0              0              1              0
       0              0              0              0              0

Matrix A is linearly independent because
the zero vector is the unique solution to Ax=0
```

Problem 4

```
S = [1 1 1; 1 3 -3; 1 0 3];
w = [25; 55; 10];
M = [S w];
rref_M = rref(M);
disp(M);
disp(rref_M);

disp("There is not a unique linear combination to express w since not all ");
disp("colums are pivot columns.");
```

```
       1              1              1             25
       1              3             -3             55
       1              0              3             10

       1              0              3             10
       0              1             -2             15
       0              0              0              0
```

Questions assigned to the following page: 5 and 4

```
There is not a unique linear combination to express w since not all
colums are pivot columns.
```

Problem 5

```
M = [1 1 2 1; 1 2 4 2; 1 1 12 3; 1 2 14 4];
rref_M = rref(M);
disp(M);
disp(rref_M);
%%a
disp("v1 is unable to be expressed as a linear combonation of v2, v3, v4 ");
    disp("because inconsistant");
%%b
M = [1 1 2 1; 2 2 4 1; 3 1 12 1; 4 2 14 1];
disp(M)
rref_M = rref(M);
disp(rref_M);
disp("v2 is unable to be expressed as a linear combonation of v1, v3, v4 ");
    disp("because inconsistant");
%%c
M = [1 1 2 1; 2 1 4 2; 3 1 12 1; 4 1 14 2];
disp(M)
rref_M = rref(M);
disp(rref_M);
disp("v3 is unable to be expressed as a linear combonation of v1, v2, v4");
   disp( " because inconsistant");
%%d
M = [1 1 1 2; 2 1 2 4; 3 1 1 12; 4 1 2 14];
disp(M)
rref_M = rref(M);
disp(rref_M);
disp("v4 is unable to be expressed as a linear combonation of v1, v2, v3");
    disp(" because inconsistant");

%%e
disp("According to the textbook, Theorem 7 in chapter 1.7 states that that");
disp("an indexed set S =  { v1, ..., vp} of two or more vectors is ");
disp("linearly dependent if and only if at least one of the vectors in S ");
    disp("is a linear combination of the others. (Lay et al.)");

disp("Citation: Lay, David C., et al. Linear Algebra and Its Applications.");
disp("5th ed., 2020.");
%%f
disp("If we only tested v2 then we could not conclude that S is linear ");
disp("independant or dependent. According to theorem 7, we must test ");
disp("all vectors in the vector set to see if they are linear ");
disp("combinations of each other.");
```

```
       1             1              2             1
       1             2              4             2
       1             1             12             3
       1             2             14             4

       1             0              0             0
       0             1              0             3/5
```

Question assigned to the following page: 5

```
       0              0              1              1/5
       0              0              0              0

v1 is unable to be expressed as a linear combonation of v2, v3, v4
because inconsistant
       1              1              2              1
       2              2              4              1
       3              1             12              1
       4              2             14              1

       1              0              5              0
       0              1             -3              0
       0              0              0              1
       0              0              0              0

v2 is unable to be expressed as a linear combonation of v1, v3, v4
because inconsistant
       1              1              2              1
       2              1              4              2
       3              1             12              1
       4              1             14              2

       1              0              0              5/3
       0              1              0              0
       0              0              1             -1/3
       0              0              0              0

v3 is unable to be expressed as a linear combonation of v1, v2, v4
 because inconsistant
       1              1              1              2
       2              1              2              4
       3              1              1             12
       4              1              2             14

       1              0              0              5
       0              1              0              0
       0              0              1             -3
       0              0              0              0

v4 is unable to be expressed as a linear combonation of v1, v2, v3
 because inconsistant
According to the textbook, Theorem 7 in chapter 1.7 states that that
an indexed set S =  { v1, ..., vp} of two or more vectors is
linearly dependent if and only if at least one of the vectors in S
is a linear combination of the others. (Lay et al.)
Citation: Lay, David C., et al. Linear Algebra and Its Applications.
5th ed., 2020.
If we only tested v2 then we could not conclude that S is linear
independant or dependent. According to theorem 7, we must test
all vectors in the vector set to see if they are linear
combinations of each other.
```

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