

Linear Algebra (Matlab Exam)

Name: _____

Gr: 1 / 1

Q1: For the two vectors, $a = [-5 -4 -3 -2 -1 0 1 2 3 4]^T$,
and $b = [0 10 20 30 40 50 60 70 80 90]^T$

Find:

- 1- The distance between a and b .
- 2- The angle between a and b .
- 3- The correlation coefficient (ρ) between a and b .
- 4- The normalized vector of a .

Distance = 165.48
 Angle = 67.32
 ρ = 1.0000

$N(a) = \begin{bmatrix} -1.56 & -1.21 & -0.87 & -0.52 & -0.17 & 0.17 & 0.52 & 0.87 & 1.2 & 1.56 \end{bmatrix}$

Q2: Solve the following equations:

1- $x_1 + 4x_2 - 2x_3 + 8x_4 = 12$
 $5x_3 - x_4 = 7$
 $0.5x_1 + 2x_2 - x_3 + 4x_4 = -2$
 $x_2 - 7x_3 + 2x_4 = -4$

$x_1 = 0$
 $x_2 = 0$
 $x_3 = 0$
 $x_4 = 1000$
 (No sol)

2- $-2x_1 + 3x_2 + 2x_3 + x_4 = 5$
 $x_1 - 2x_4 = -3$
 $2x_2 + 2x_3 = 0$
 $x_3 + 3x_4 = 1$

$x_1 = -3$
 $x_2 = -1$
 $x_3 = 1$
 $x_4 = 0$
 (many sol)

3- $x_1 + 4x_2 - 2x_3 + 8x_4 = 12$
 $5x_3 - x_4 = 7$
 $x_3 + 3x_4 = -5$
 $x_2 - 7x_3 + 2x_4 = -4$

$x_1 = 2$
 $x_2 = 7$
 $x_3 = 1$
 $x_4 = -2$

1.0000	0	0	5.2000	0
0	1.0000	0	0	6000
0	0	1.0000	-2.2000	0
0	0	0	8	1.0000
1	0	0	-2	-3
0	1	0	-3	-1
0	0	1	3	1
0	0	0	0	0
1	0	0	0	2
0	1	0	0	7
0	0	1	0	1
0	0	0	1	-2

b Functions: norm(a), mean(a), std(a,1), rms(a), and rref(A).

Linear Algebra (Matlab Final exam)1

Name: _____ No: _____ Gr: _____

Q1: Find the normalized vector N_a of the vector:

$$a = [6 \ 3 \ 2 \ 1 \ 0 \ -2 \ -3 \ -4 \ -6]^T$$

$N_a =$

Q2: Solve the following equation:

$$\begin{aligned} 2x_1 + x_2 - x_3 + 5x_4 + x_5 &= 1 \\ x_1 - 2x_2 + x_4 - 3x_5 &= 0 \\ 2x_1 + 2x_2 + 2x_3 + 2x_4 + 2x_5 &= 8 \\ 4x_1 + 2x_2 - 2x_3 + 10x_4 + 2x_5 &= 2 \\ x_2 - 2x_3 + 3x_4 - 4x_5 &= 2 \end{aligned}$$

Q3: Find the left or right inverse for the following matrices:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

Left inverse

Right inverse

Q4: for the following table:

Input x_1	1	2	3	4	5	7	8	9
Input x_2	10	20	33	44	55	70	80	90
Output y	11	13	15	15	16	17	17	19

1- Find the equation using least squares

$y =$

2- Predict the output y if $x_1=6$, and $x_2=65$

$y =$

Q5: Find the eigenvalues and eigenvectors of the matrix A :

$$A = \begin{bmatrix} 0 & -1 & -1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$

$$\lambda_1 =$$

$$\lambda_2 =$$

$$\lambda_3 =$$

 $v_1 =$
 $v_2 =$
 $v_3 =$

Matlab Functions: norm(a), mean(a), std(a,1), rref(A), pinv(A), and eig(A)