Math 100 Homework 1

1- Acknowledgment Statement: Please write the following statement as the answer to Exercise 1 and place your signature right below the statement.

"I acknowledge that it is my responsibility to carefully read the class notes before attempting the homework problems. I understand that what is in the class notes is the minimum I should know, and I should not expect to pass this course if I do not fully understand the material covered in the class notes." Pulle Ortigo

See bottom of page for more neat writing
2- In class, we discussed two viewpoints regarding what linear algebra is about, namely the applied perspective and the abstract perspective. Reproduce the descriptions discussed in class, Applied-Linear Algebra is a collection of methods releted to linear Abstract - Linear Algebra is about rectar spaces & Equations.

linear transformations between vector spaces
3- In class, we mentioned that linear algebra can be viewed as a course about language. List the four languages that were discussed in class. Linear Systems, Vectors in IR", Matrices, vector spaces

4- For each problem, determine whether the equation is linear or nonlinear. If the equation is linear, list the unknowns and their coefficients.

· 4-a) x1+x2=5 Yes (oefficient=1 Unknow= X11x2

- · 4-b) √2x1+5x2-6x3=7 yes coefficient = J2,5,-6 unknown. X, , X2, X3
- · 4-c) x+y+z=10 yes coefficient =1 unknown < x, V, 2
- 4-d) xy + yz + xz = 20 No
- $x^2 + v^2 + z^2 = 1$ No
- 5- For each of the following linear systems, determine the number of equations and the number of unknowns.

5-a)

$$\begin{cases} 2x_1 & -6x_3 = -8 \ 2 \ \text{equations} \\ x_2 + 2x_3 = 3 \ 3 \ \text{Unknowns} \ \lambda_1, \lambda_2, \lambda_3 \end{cases}$$

• 5-b)

$$\begin{cases} x_1 - x_2 = 2 & \text{2 equations} \\ x_1 + x_2 = 5 & \text{2 unknowns} & \text{Xi i X2} \end{cases}$$

• 5-c)

$$\begin{cases} x_1 + x_2 = 7 & \text{if } eq \text{ is from s} \\ 10x_1 + 9x_2 = 8 & 2 \text{ vin Knowns} & x_1, x_2 \\ -x_1 + 3x_2 = -2 \\ x_1 - x_2 = 6 \end{cases}$$

6- As discussed in class, the names we choose for the unknowns will not impact the solution set of the linear system. Rewrite the following linear system using the symbols x, y, z instead of x_1, x_2, x_3 , respectively.

$$\begin{cases} x_1 + \sqrt{3}x_2 + x_3 = 10 & \text{if } x \neq \frac{1}{2} = 10 \\ 10x_1 + 2x_2 - x_3 = \sqrt{2} & \text{if } x \neq 2y = \frac{1}{2} = \sqrt{2} \end{cases}$$

7- Consider the following linear system, which consists of one equation and three unknowns:

 $x_1 + x_2 + 2x_3 = 1$

Clearly, $(x_1 = 0, x_2 = 0, x_3 = \frac{1}{2})$ is one solution of this system. List four other solutions for this system. How many solutions does this system have? $x_1 = 1$ $x_2 = 1$ $x_3 = -\frac{1}{2}$ $x_1 = 2$ $x_2 = 2$ $x_3 = -\frac{3}{2}$ $x_1 = 3$ $x_2 = 3$ $x_3 = -\frac{3}{2}$ X1=4 X2=4 X3=-7/2

8- Consider the linear system

$$0x + 0y + 0z = 1$$

How many solutions does this system have?

None

9- Solve the linear system

$$\begin{cases} 3x_1 - x_2 = 5 & X_1 = 1 \\ -x_1 + x_2 = -1 & X_2 = 1 \end{cases}$$

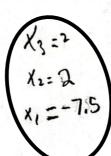
Draw the corresponding lines in the x_1x_2 -plane and identify the solution as the point of intersection.

- No only I solution , no solution, or infinite solution 10- Is there a linear system with exactly five solutions?
- 11- Solve the following nice linear system by backward substitution.

$$\begin{cases} 2x_1 + 5x_2 + 6x_3 = 7 \\ x_2 + x_3 = 4 \\ 3x_3 = 6 \\ \hline{3} & \end{cases}$$

$$\begin{cases} 2x_1 + 5x_2 + 6x_3 = 7 \\ x_2 + x_3 = 4 \\ -2 & \end{cases}$$

$$\begin{cases} 2x_1 + 5x_2 + 6x_3 = 7 \\ x_2 + x_3 = 4 \\ -2 & \end{cases}$$



$$2x_1 + 5(2) + 6(2) = 7$$
 $2x + 10 + 12 = 7$
 $2x + 21 = 7$

$$+ 21 = 1$$
 $-11 - 12$
 $2x = -15$
 $x = 7.5$

$$4, 5x_1 - x_2 = 4$$

$$q, 3x_1 - x_2 = 5$$
 $3x_1 - (-1+x_1) = 5$ $x_1 = 2$

$$X_1 = 2$$

$$-x_1 + x_2 = -1$$
 $3x_1 + 1 - x_1 = -1$

2. In class we dicussed 2 view points regulating what Linear algebra is about, warnely the applied perspective 3 the abstract perspective. Reproduce the description discussed in class. Abstract - Linear Alegebra is about vector spaces 3 Linear transformations. between vector spaces. Applied - Linear Algebra is a collection of methods related to linear equations.

3. In class we mentioned that Linear Algebra can be viewed as a Course about Languages. List the 4 languages that were discussed in Class. Linear Systems, Vectors in IRN, Matrices, Vector spaces