MATH2210Q - Quiz #1 Name: Key

For full credit, you must show all work and circle your final answer.

$\boxed{1}$ Find the solution set to the following system of equations. (Write it in parametric form.)

$$\begin{array}{rcrcrl} x_1 & + & 2x_2 & - & 3x_3 & = 5 \\ 2x_1 & + & x_2 & - & 3x_3 & = 13 \\ -x_1 & + & x_2 & & & = -8 \end{array}$$

$$\begin{bmatrix} 1 & 2 & -3 & 5 \\ 2 & 1 & -3 & 13 \\ -1 & 1 & 0 & -8 \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & -3 & 5 \\ 0 & -3 & 3 & 3 \\ 0 & 3 & -3 & -3 \end{bmatrix}$$

$$\sim \begin{bmatrix} 1 & 2 & -3 & 5 \\ 0 & -3 & 3 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\sim \begin{bmatrix} 1 & 2 & -3 & 5 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\sim \begin{bmatrix} 1 & 0 & -1 & 7 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 7 \\ -1 \\ 0 \end{bmatrix} + t \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$ t is a real #

2 Let T be the following linear transformation.

$$T : \mathbb{R}^3 \to \mathbb{R}^3; \qquad T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} 2x_1 - 4x_2 \\ x_1 - x_2 \\ -x_1 + 3x_2 \end{bmatrix}$$

(a) Find the standard matrix for T.

$$A = \begin{bmatrix} 2 & -4 & 0 \\ 1 & -1 & 0 \\ -1 & 3 & 0 \end{bmatrix}$$

Note: $\begin{bmatrix} 2 & -4 & 0 \\ 1 & -1 & 0 \\ -1 & 3 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} 2X_1 - 4X_2 \\ X_1 - X_2 \\ -X_1 + 3X_2 \end{bmatrix}$

(b) Determine if T is a one to one linear transformation.

No, A linear transformation is one to one if and only if the columns are linearly indep

The columns of A are not lineerly indep. there is a zero column.

3 (a) Compute $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 0 & 1 \\ 1 & 2 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & 2 & 0 \\ 1 & 1 & 2 \\ 2 & 0 & 0 \end{bmatrix}$

$$= \begin{bmatrix} 11 & 4 & 4 \\ 11 & 6 & 0 \\ 9 & 4 & 4 \end{bmatrix}$$

(b) Find the inverse of $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

$\det = 10 - 12 = -2$

$$\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}^{-1} = \frac{-1}{2} \begin{bmatrix} 5 & -3 \\ -4 & 2 \end{bmatrix}$$