MATH 3160 Test 1

Name:____

You must show your work for full credit. No calculators, no phones, no electronics allowed.

1. Solve the following systems of linear equations using row reduction. Must get to RREF. $\begin{cases} 2x_1 & & +x_3 & = 0 \\ x_1 & -x_2 & +x_3 & = 1 \\ & 4x_2 & +x_3 & = 5 \end{cases}$

2. Solve the following systems of linear equations using row reduction. Must get to RREF.

$$\begin{cases} 2x_1 & & +x_3 & = 0 \\ x_1 & -x_2 & & = 2 \\ x_1 & +x_2 & +x_3 & = 0 \end{cases}$$

3. Solve the following systems of linear equations using row reduction.

$$\begin{cases} x_1 & -x_2 & +x_3 & & +x_5 & = 0 \\ & & +2x_3 & +x_4 & & = 0 \\ & & x_3 & & -x_5 & = 0 \end{cases}$$

4. For the following system, find the solution.

$$\begin{cases} x_1 & +x_2 & = 4 \\ x_1 & -x_2 & = 6 \end{cases}$$

Solve the system using $A\mathbf{x} = \mathbf{b}$.

(a) First write the system as $A\mathbf{x} = \mathbf{b}$. That is, identify A, $\mathbf{x}$ and $\mathbf{b}$.

(b) Compute A^{-1} if it exists. If it doesn't explain why.

(c) Compute $\mathbf{x}$ using A^{-1}.

5. For the following system, find the solution.

$$\begin{cases} x_1 & +x_2 & = 4 \\ x_1 & -x_2 & = 6 \end{cases}$$

Solve the system using Cramer's Rule.

6. Find the inverse ot the following matrix. If it doesn't explain why.

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

7. Let $T : \mathbb{R}^n \to \mathbb{R}^m$ be defined as

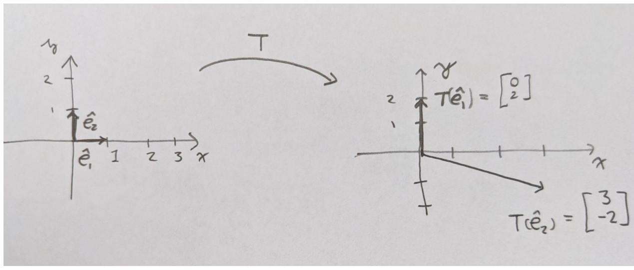
$$T\left(\begin{array}{c} x \\ y \\ z \end{array}\right) = \begin{bmatrix} x+y \\ 2y-z \\ 3x+z \end{bmatrix}.$$

(a) What are n and m above? What is the domain, and what is the codomain?

(b) Write the matrix of T. That is write the matrix A so that

$$T\left(\begin{array}{c} x \\ y \\ z \end{array}\right) = A\begin{bmatrix} x \\ y \\ z \end{bmatrix}.$$

8. Let $T : \mathbb{R}^n \to \mathbb{R}^m$ be defined as



That is $T\begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$. and $T\begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$.

(a) Find A so that

$$T\begin{pmatrix} x \\ y \end{pmatrix} = A\begin{bmatrix} x \\ y \end{bmatrix}.$$

(b) Find A^{-1}.

(c) Compute the following

$$T\begin{pmatrix} 0 \\ 2 \end{pmatrix}, \text{and } A^{-1}\begin{bmatrix} 6 \\ -4 \end{bmatrix}.$$