

Math 3160 - Test 1

Name: _____

1. Solve the following SLE using row reduction. Reduce to RREF and interpret.

$$\begin{cases} x_1 & -2x_2 & +2x_3 & +4x_4 & = 3 \\ & x_2 & -x_3 & +x_4 & = -2 \\ x_1 & & & +6x_4 & = -1 \end{cases}$$

2. Solve the following SLE using row reduction. Reduce to RREF and interpret.

$$\begin{cases} x_1 & -2x_2 & +2x_3 & +4x_4 & = 3 \\ & x_2 & -x_3 & +x_4 & = 0 \\ x_1 & & & +6x_4 & = 0 \end{cases}$$

3. Solve the following SLE using row reduction. Reduce to RREF and interpret.

$$\begin{cases} 2x_1 & -2x_2 & +4x_3 & = 2 \\ & & x_3 & = 1 \\ & x_2 & +2x_3 & = 0 \end{cases}$$

4. Solve the following SLE by setting up problem as a matrix problem and by finding an inverse matrix. You must clearly identify A , $\mathbf{x}$, and $\mathbf{b}$.

$$\begin{cases} x_1 & -x_2 & +4x_3 & = 5 \\ & & 3x_3 & = 6 \\ 2x_1 & & +7x_3 & = 11 \end{cases}$$

5. Solve the following SLE using cramer's Rule. Clearly identify A , A_1 , and A_2 .

$$\begin{cases} x_1 & -x_2 & = 5 \\ 2x_1 & x_2 & = 6 \end{cases}$$

6. Write the matrix for the following transformations described below.
- (a) $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ where the plane is reflected about the x -axis.
 - (b) $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ where the plane is reflected about the x -axis and then reflected about the y -axis.
 - (c) $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ where the plane is rotated by 60 degrees counter-clockwise.

7. Let $\mathbf{v} = (1, 3, 4)$ and $\mathbf{w} = (1, -1, 0)$ be vectors in $\mathbb{R}^3$. and let $P(1, 1, 1)$ and $Q(0, -4, 0)$ be two points in $\mathbb{R}^3$.
- (a) Find the vector $\overrightarrow{PQ}$ and a unit vector in the same direction as $\overrightarrow{PQ}$.
 - (b) Find a vector that is parallel to $\mathbf{v}$ and unit.
 - (c) Compute $\|2\mathbf{v} - \mathbf{w}\|$.