

Math 3160 - Test 1

Name: _____

Show all work. Your work will be graded.

1. Solve the following systems of linear equations using row reduction (must be in RREF).

$$\begin{cases} 2x_1 & +6x_3 & -2x_4 & +4x_5 & = 8 \\ & x_2 & +x_3 & x_4 & +x_5 & = 0 \\ & & & -2x_4 & +4x_5 & = 6 \end{cases}$$

2. Solve the following systems of linear equations using row reduction (must be in RREF).

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

3. Solve the following systems of linear equations by setting up problem as a matrix problem and by finding an inverse matrix ($A\mathbf{x} = \mathbf{b}$).

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

4. Solve the following using Cramer's rule.

$$\begin{cases} x + y = 1 \\ x - y = 5 \end{cases}$$

5. Let $P(1, 0, 1)$, $Q(1, -1, 0)$ and $R(0, -1, 0)$ be points in $\mathbb{R}^3$.
- (a) What is the parametric equation of the plane containing P , Q and R ?
 - (b) What is the point-normal equation of the plane containing P , Q and R ?
 - (c) What is area of the triangle formed by the points P , Q and R ?

6. Let $\mathbf{u} = (1/3, 2/3, -2/3)$, $\mathbf{v} = (1, 2, 3)$ and let $\mathbf{w} = (3, -4, 0)$. Compute the following.
- (a) Compute $\text{Proj}_{\mathbf{w}}\mathbf{v}$.
 - (b) Find the component of $\mathbf{v}$ parallel to $\mathbf{u}$, and the component of $\mathbf{v}$ orthogonal to $\mathbf{u}$. We called these $\mathbf{C}_1$ and $\mathbf{C}_2$ in class.

7. Compute the following. Let

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

- (a) The determinant of A .
- (b) The inverse of A .
- (c) $A^2 = AA$.

- ec. Three professors were chatting and comparing favorite movies. We ranked them from zero to ten (see the table below).

	Titantic	Avengers	Casablanca	Godfather
Professor 1	8	3	2	2
Professor 2	2	9	8	9
Professor 3	3	5	9	10

- Consider each professor as a vector say Professor 1 is $\mathbf{v}_1 = (8, 3, 2, 2)$. What are the vectors $\mathbf{v}_2$ and $\mathbf{v}_3$?
- Find the angle between $\mathbf{v}_1$ and $\mathbf{v}_2$ and the angle between $\mathbf{v}_2$ and $\mathbf{v}_3$. Interpret.