

Practice Exam 1

Name:.....

Make sure to neatly and clearly show all work for each problem.

1. Find the solution to the following system of equations. Show all work.

$$\begin{aligned}x_1 - 3x_3 &= -2 \\3x_1 + x_2 - 2x_3 &= 5 \\2x_1 + 2x_2 + x_3 &= 4\end{aligned}$$

1. Written Solution
  2. Video Solution
2. Let

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 5 & 1 & -2 \\ 2 & 2 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 1 & 2 \\ -4 & 1 & 3 \\ -4 & -1 & -2 \end{bmatrix} \quad C = \begin{bmatrix} 2 \\ 3 \\ 2 \end{bmatrix}$$

Then find  $AC + BC$ .

1. Written Solution
  2. Video Solution
3. Let  $A, B, C$  be matrices of the same size. Prove that  $A + (B + C) = (A + B) + C$ .
1. Written Solution
  2. Video Solution
4. Find the inverse of the matrix

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 5 & 4 \\ 3 & 6 & 5 \end{bmatrix}$$

1. Written Solution
2. Video Solution

5. Find the inverse of the matrix

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

Use this to solve the system of equations  $A\mathbf{x} = \mathbf{b}$  if

$$\mathbf{b} = \begin{bmatrix} 1 \\ 3 \\ -3 \end{bmatrix}$$

Find  $A^{-1}$  as in problem 4. Then find  $A^{-1} * B$  as in problem 2.

6. Find the determinant of

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

1. Written Solution 1
2. Video Solution 1
3. Written Solution 2
4. Video Solution 2

7. Prove or disprove the following.

**Theorem 1.** *A matrix is nilpotent if  $A^k = 0$  for some natural number  $k$ . Let  $A$  be nilpotent, then  $|A| = 0$ .*

1. Written Solution
2. Video Solution