

Chapter 10 Matrices and Determinants

Section 10.1 Matrices and Systems of Equations

Objective: In this lesson you learned how to use matrices, Gaussian elimination, and Gauss-Jordan elimination to solve systems of linear equations.

Course Number

Instructor

Date

Important Vocabulary

Define each term or concept.

Entry of a matrix

Order of a matrix

Square matrix

Main diagonal

Row matrix

Column matrix

Elementary row operations

Gauss-Jordan elimination

I. Matrices (Pages 708–709)

If m and n are positive integers, an $m \times n$ matrix is . . .

What you should learn

How to write a matrix and identify its order

An $m \times n$ matrix has _____ rows and _____ columns.

An **augmented matrix** is . . .

A **coefficient matrix** is . . .

Example 1: Consider the following system of equations.

$$\begin{cases} 2x + y - z = 5 \\ x - 3y + 2z = 9 \\ 3x + 2y = 1 \end{cases}$$

- Write the augmented matrix for this system.
- What is the order of the augmented matrix?
- Write the coefficient matrix for this system.
- What is the order of the coefficient matrix?

II. Elementary Row Operations (Pages 710–712)

The **elementary row operations** on a matrix are:

What you should learn
How to perform
elementary row
operations on matrices

Two matrices are **row-equivalent** if . . .

A matrix in **row-echelon form** has the following three properties:

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A matrix in row-echelon form is in **reduced row-echelon form** if . . .

III. Gaussian Elimination with Back-Substitution (Pages 713–714)

To solve a system of linear equations using Gaussian Elimination with Back-Substitution, . . .

What you should learn
How to use matrices and Gaussian elimination to solve systems of linear equations

If, during the elimination process, you obtain a row with zeros except for the last entry, you can conclude that the system has _____.

Example 2: Solve the following system using Gaussian Elimination with Back-Substitution.

$$\begin{cases} x + y + z = 1 \\ x + 2y + 3z = 1 \\ x - 3y + 5z = -11 \end{cases}$$

IV. Gauss-Jordan Elimination (Pages 715–717)

Example 3: Apply Gauss-Jordan elimination to the following matrix to obtain the unique reduced row-echelon form of the matrix.

$$\left[\begin{array}{ccc|c} 1 & 4 & 2 & 5 \\ 0 & 1 & -1 & 3 \\ 0 & 0 & 1 & -2 \end{array} \right]$$

What you should learn
How to use matrices and Gauss-Jordan elimination to solve systems of linear equations

Example 4: Solve the following system using Gauss-Jordan elimination.

$$\begin{cases} 2x - y + 3z = 1 \\ x + 2y - 4z = -6 \\ -2x + 3y - z = 13 \end{cases}$$

Homework Assignment

Page(s)

Exercises