Chapter 8 Matrices and Determinants

Course Number
Instructor
Date

Section 8.1 Matrices and Systems of Equations

Objective: In this lesson you learned how to write matrices, identify their order, and perform elementary row operations and how to use Gaussian elimination and Gauss-Jordan elimination with matrices to solve systems of linear equations.

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 552–553)

What you should learn
How to write matrices and identify their orders

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

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.

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

(a) Write the augmented matrix for this system.
(b) What is the order of the augmented matrix?
(c) Write the coefficient matrix for this system.
(d) What is the order of the coefficient matrix?

II. Elementary Row Operations (Page 554)

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

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

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

III. Gaussian Elimination with Back-Substitution (Pages 555–558)

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

A matrix in **row-echelon form** has the following three properties:
1.

2.

3.

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

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

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 559–561)

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

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

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

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