

# Chapter 7 Matrices and Determinants

## Section 7.1 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 510–511)

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 512–514)

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

### III. Gaussian Elimination with Back-Substitution (Pages 515–516)

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 517–519)

**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