

## Section 7.3 Multivariable Linear Systems

**Objective:** In this lesson you learned how to recognize linear systems in row-echelon form and to use back-substitution to solve the systems, how to solve systems of equations by Gaussian elimination, how to solve nonsquare systems of equations, and how to use systems of linear equations in three or more variables to model and solve real-life problems.

Course Number

Instructor

Date

### Important Vocabulary

Define each term or concept.

**Row-echelon form**

**Ordered triple**

**Row operations**

**Gaussian elimination**

**Nonsquare system of equations**

### I. Row-Echelon Form and Back-Substitution (Page 577)

When elimination is used to solve a system of linear equations, the goal is . . .

#### *What you should learn*

How to recognize linear systems in row-echelon form and use back-substitution to solve the systems

**Example 1:** Solve the system of linear equations.

$$\begin{cases} x + y - z = 9 \\ y - 2z = 4 \\ z = 1 \end{cases}$$

### II. Gaussian Elimination (Pages 578–581)

To solve a system that is not in row-echelon form, . . .

#### *What you should learn*

How to use Gaussian elimination to solve systems of linear equations

List the three row operations on a system of linear equations that produces an equivalent system of linear equations.

- 1.
- 2.
- 3.

The solution(s) of a system of linear equations in more than two variables must fall into one of the following three categories:

- 1.
- 2.
- 3.

**Example 2:** Solve the system of linear equations.

$$\begin{cases} x + y + z = 3 \\ 2x - y + 3z = 16 \\ x - 2y - z = 1 \end{cases}$$

**Example 3:** The following equivalent system is obtained during the course of Gaussian elimination. Write the solution of the system.

$$\begin{cases} x + 2y - z = 4 \\ y + 2z = 8 \\ 0 = 0 \end{cases}$$

**III. Nonsquare Systems** (Page 582)

In a square system of linear equations, the number of equations in the system is \_\_\_\_\_ the number of variables.

If a system has more variables than equations, the system cannot have a(n) \_\_\_\_\_.

**Example 4:** Solve the system of linear equations.

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

***What you should learn***  
How to solve nonsquare systems of linear equations

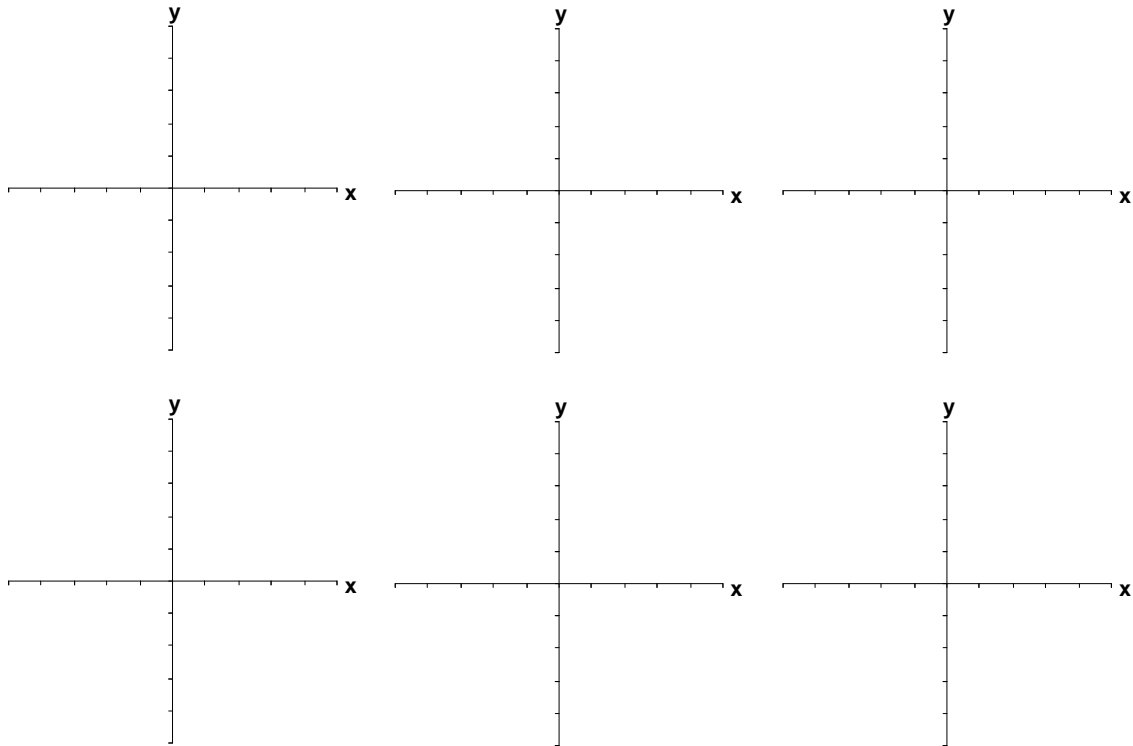
**IV. Applications of Multivariable Systems** (Pages 583–584)

The height at time  $t$  of an object that is moving in a vertical line with constant acceleration  $a$  is given by the position equation \_\_\_\_\_, where  $s$  is measured in feet,  $t$  is measured in seconds,  $v_0$  is the initial velocity, and  $s_0$  is the initial height.

Describe a situation or application in which solving a system of multivariable linear systems is required.

**Example 5:** Find a quadratic equation,  $y = ax^2 + bx + c$ , whose graph passes through the points  $(-4, 36)$ ,  $(0, 8)$ , and  $(2, 0)$ .

***What you should learn***  
How to use systems of linear equations in three or more variables to model and solve application problems

**Additional notes****Homework Assignment**

Page(s)

Exercises