Course Number
Instructor
Date

Section 7.3 Multivariable Linear Systems

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

Important Vocabulary Define each term or concept.

Row-echelon form

Ordered triple

Gaussian elimination

Nonsquare system of equations

Three-dimensional coordinate system

Graph of an equation in three variables

Partial fraction

Partial fraction decomposition

Basic equation

I. Row-Echelon Form and Back-Substitution (Page 509)

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

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

Example 1: Solve the system of linear equations.

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

II. Gaussian Elimination (Pages 510–512)

> ***What you should learn***
> How to use Gaussian elimination to solve systems of linear equations

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

List the three elementary row operations that can be used on a system of linear equations to produce 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.

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

A consistent system having exactly one solution is ____________________. A consistent system with infinitely many solutions is ___________________.

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 513)

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

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.

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

IV. Graphical Interpretation of Three-Variable Systems (Page 514)

What you should learn
How to graphically interpret three-variable systems

To sketch the graph of a plane, . . .

The graph of a system of three linear equations in three variables consists of _______________ planes. When these planes intersect in a single point, the system has _________________ solution(s). When the planes have no point in common, the system has ____________ solution(s). When the planes intersect in a line or a plane, the system has __________________ solution(s).

V. Partial Fraction Decomposition and Other Applications

What you should learn
How to use systems of linear equations to write partial fraction decompositions of rational expressions and to use systems of linear equations in three or more variables to model and solve real-life problems

Suppose the rational expression $N(x)/D(x)$ is an improper fraction. Before the expression can be decomposed into partial fractions, you must . . .

To decompose a proper rational expression into partial fractions,

completely factor the denominator into factors of the form

__________________ and ______________________, where

______________________ is irreducible.

Describe how to deal with both linear factors and quadratic factors in the next step of a partial fraction decomposition.

To find the **basic equation** of a partial fraction

decomposition, . . .

To solve the basic equation, . . .

Example 5: Write the form of the partial fraction decomposition for $\dfrac{x-4}{x^2-8x+12}$.

Example 6: Solve the basic equation $5x+3=A(x-1)+B(x+3)$ for A and B.

Homework Assignment

Page(s)

Exercises