

Section 6.5 Applications of Matrices and Determinants

Objective: In this lesson you learned how to use Cramer's Rule to solve systems of linear equations.

Course Number

Instructor

Date

Important Vocabulary Define each term or concept.

Uncoded row matrices

Coded row matrices

I. Area of a Triangle (Page 477)

The area of a triangle with vertices (x_1, y_1) , (x_2, y_2) , and (x_3, y_3) is

$$\text{Area} = \pm \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

where the symbol \pm indicates that the appropriate sign should be chosen to yield a positive area.

Example 1: Find the area of a triangle whose vertices are $(-3, 1)$, $(2, 4)$, and $(5, -3)$.

What you should learn

How to use determinants to find areas of triangles

II. Collinear Points (Page 478)

Collinear points are . . .

Three points (x_1, y_1) , (x_2, y_2) , and (x_3, y_3) are collinear if and only if

$$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0.$$

Example 2: Determine whether the points $(-2, 4)$, $(0, 3)$, and $(8, -1)$ are collinear.

What you should learn

How to use determinants to decide whether points are collinear

III. Cramer's Rule (Pages 479–481)

Cramer's Rule states that if a system of n linear equations in n variables has a coefficient matrix A with a nonzero determinant $|A|$, the solution of the system is

$$x_1 = \frac{|A_1|}{|A|}, \quad x_2 = \frac{|A_2|}{|A|}, \dots, x_n = \frac{|A_n|}{|A|}$$

where the i th column of A_i is _____
_____.

Cramer's Rule does not apply if the determinant of the coefficient matrix is _____, in which case the system has either no solution or _____.

Example 3: Use Cramer's Rule to solve the system of linear equations.

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

IV. Cryptography (Pages 482–484)

A cryptogram is . . .

To use matrix multiplication to encode and decode messages, . . .

What you should learn

How to use Cramer's Rule to solve systems of linear equations

What you should learn

How to use matrices to code and decode messages

Homework Assignment

Page(s)

Exercises