TEKS 2A.3.B

LESSON 4-4

Determinants and Cramer's Rule

Know it! Note

Lesson Objectives (p. 270):

Vocabulary

1. Determinant (p. 270):

2. Coefficient matrix (p. 271):

3. Cramer's rule (p. 271):

Key Concepts

4. Determinant of a 2 × 2 Matrix (p. 270):

WORDS	NUMBERS	ALGEBRA

5. Cramer's Rule for Two Equations (p. 271):

TEKS 2A.3.B

LESSON 4-4

Determinants and Cramer's Rule

Know it! Note

Lesson Objectives (p. 270):

find the determinants of 2 × 2 and 3 × 3 matrices; use Cramer's rule to solve systems of linear equations.

Vocabulary

1. Determinant (p. 270): the difference of the products of the diagonals on a 2 × 2 matrix.

2. Coefficient matrix (p. 271): the matrix formed by the coefficients for the variables in a system of linear equations.

3. Cramer's rule (p. 271): a calculated value used to tell whether a system of linear equations has one solution, no solution, or infinitely many solutions.

Key Concepts

4. Determinant of a 2 × 2 Matrix (p. 270):

WORDS	NUMBERS	ALGEBRA
The determinant of a 2 by 2 matrix is the difference of the products of the diagonals.	$\det\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix} =$ $\begin{matrix}+\\-\end{matrix}\begin{vmatrix}1 & 2\\3 & 4\end{vmatrix} = (1)(4) - (3)(2) = -2$	$\det\begin{bmatrix}a & b\\c & d\end{bmatrix} =$ $\begin{matrix}+\\-\end{matrix}\begin{vmatrix}a & b\\c & d\end{vmatrix} = ad - cb$

5. Cramer's Rule for Two Equations (p. 271):

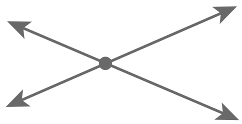
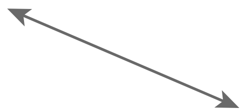
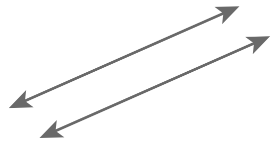
$$\begin{cases}a_1x + b_1y = c_1\\ a_2x + b_2y = c_2\end{cases} \text{ has solutions } x = \frac{\begin{vmatrix}c_1 & b_1\\ c_2 & b_2\end{vmatrix}}{D},\ y = \frac{\begin{vmatrix}a_1 & c_1\\ a_2 & c_2\end{vmatrix}}{D}, \text{ where } D = \begin{vmatrix}a_1 & b_1\\ a_2 & b_1\end{vmatrix}.$$

6. Solutions of Systems (p. 271)

Solutions of Systems		

7. Cramer's Rule for Three Equations (p. 273):

6. Solutions of Systems (p. 271)

Solutions of Systems		
If $D \neq 0$ the system is consistent and has one unique solution.	**If $D = 0$ and at least one numerator determinant is 0, the system is dependent and has infinitely many solutions.**	**If $D = 0$ and neither numerator determinant is 0, the system is inconsistent and has no solution.**
		

7. Cramer's Rule for Three Equations (p. 273):

The system $\begin{cases} a_1x + b_1y + c_1z = d_1 \\ a_2x + b_2y + c_2z = d_2 \\ a_2x + b_2y + c_2z = d_3 \end{cases}$ **has solutions given by**

$$x = \frac{\begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix}}{D},\ y = \frac{\begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix}}{D},\ z = \frac{\begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix}}{D} \text{ where } D = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} \text{ and } D \neq 0.$$