

Section 10.4 The Determinant of a Square Matrix

Objective: In this lesson you learned how to find minors, cofactors, and determinants of square matrices.

Course Number

Instructor

Date

Important Vocabulary

Define each term or concept.

Determinant**Minors****Cofactors**

I. The Determinant of a 2×2 Matrix (Pages 746–747)

The **determinant** of the 2×2 matrix $A = \begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix}$ is given by

$$\det(A) = |A| = \begin{vmatrix} & \\ & \end{vmatrix} = \underline{\hspace{2cm}}$$

What you should learn

How to find the determinants of 2×2 matrices

The determinant of a matrix of order 1×1 is defined as . . .

Example 1: Find the determinant of the matrix $A = \begin{bmatrix} -4 & 3 \\ 1 & -2 \end{bmatrix}$.

II. Minors and Cofactors (Page 748)

Complete the sign patterns for cofactors of a 3×3 matrix, a 4×4 matrix, and a 5×5 matrix:

Sign Pattern for Cofactors

3 \times 3 matrix

$$\begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}$$

4 \times 4 matrix

$$\begin{bmatrix} & & & \\ & & & \\ & & & \\ & & & \end{bmatrix}$$

5 \times 5 matrix

$$\begin{bmatrix} & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \end{bmatrix}$$

What you should learn

How to find minors and cofactors of square matrices

Example 2: Use the matrix $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & 0 \\ 0 & 2 & 3 \end{bmatrix}$ to find:

- (a) the minor M_{13} , and (b) the cofactor C_{21} .

III. The Determinant of a Square Matrix (Pages 749–750)

Applying the definition of the determinant of a square matrix to find a determinant is called _____.

What you should learn
How to find the determinants of square matrices

Example 3: Find the determinant of the matrix:

$$A = \begin{bmatrix} -1 & 0 & 4 \\ 3 & -2 & 0 \\ 1 & -1 & 1 \end{bmatrix}$$

Example 4: Describe a strategy for finding the determinant of the following matrix, and then find the determinant of the matrix.

$$B = \begin{bmatrix} -2 & 4 & 0 & 5 \\ 0 & 2 & -1 & 0 \\ 3 & 1 & -4 & -1 \\ -5 & 0 & -2 & 3 \end{bmatrix}$$

Homework Assignment

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Exercises