

Section 7.7 The Determinant of a Square Matrix

Objective: In this lesson you learned how to find 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 551–552)

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 553)

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

What you should learn

How to find minors and cofactors of square matrices

Sign Pattern for Cofactors

3 × 3 matrix

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

4 × 4 matrix

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

5 × 5 matrix

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

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 554–555)

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.

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

IV. Triangular Matrices (Page 555)

A **triangular matrix** is . . .

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

A square matrix is _____ if it has all zero entries below its main diagonal and is _____ if it has all zero entries above its main diagonal.

A **diagonal matrix** is . . .

To find the determinant of a triangular matrix of any order, . . .

Example 5: Find the determinant of the following matrix:

$$A = \begin{bmatrix} 3 & -1 & 2 & 5 & -6 & -2 \\ 0 & -1 & 3 & -4 & 2 & 1 \\ 0 & 0 & 2 & -2 & -2 & 5 \\ 0 & 0 & 0 & 1 & -3 & -1 \\ 0 & 0 & 0 & 0 & 4 & 8 \\ 0 & 0 & 0 & 0 & 0 & -2 \end{bmatrix}$$

Additional notes**Homework Assignment**

Page(s)

Exercises