Course Number

Instructor

Date

Section 8.2 Operations with Matrices

Objective: In this lesson you learned how to add and subtract matrices, multiply matrices by real numbers, and multiply two matrices.

Important Vocabulary Define each term or concept.

Scalars

Scalar multiple

Zero matrix

Matrix multiplication

Identity matrix of order *n*

I. Equality of Matrices (Page 635)

What you should learn
How to decide whether two matrices are equal

Name three ways that a matrix may be represented.

1)

2)

3)

Two matrices are equal if they have the same order and

_____ are equal.

II. Matrix Addition and Scalar Multiplication (Pages 636–639)

What you should learn
How to add and subtract matrices and multiply matrices by real numbers

To add two matrices of the same order, . . .

To multiply a matrix A by a scalar c, . . .

Example 1: Let $A = \begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 4 \\ 2 & -5 \end{bmatrix}$.
Find (a) $A + B$ and (b) $-2B$

Let A, B, and C be $m \times n$ matrices and let c and d be scalars.
Give an example of each of the following properties of matrix addition and scalar multiplication:

1) Commutative Property of Matrix Addition: _____

2) Associative Property of Matrix Addition: _____

3) Associative Property of Scalar Multiplication: _____

4) Scalar Identity: _____

5) Distributive Property (two forms): _____

_____

If A is an $m \times n$ matrix and O is the $m \times n$ zero matrix, then

$A + O =$ _____.

III. Matrix Multiplication (Pages 640–642)

What you should learn
How to multiply two matrices

When multiplying an $m \times n$ matrix A by an $n \times p$ matrix B, to obtain the entry in the ith row and jth column of AB, . . .

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Example 2: If A is a 3×5 matrix and B is a 6×3 matrix, find the order, if possible, of the product (a) AB, and (b) BA.

Example 3: Find the product AB, if

$$A = \begin{bmatrix} 2 & -1 & 7 \\ 0 & 6 & -3 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 0 \\ -2 \\ 3 \end{bmatrix}$$

List four properties of Matrix Multiplication:

If A is an $n \times n$ matrix, the identity matrix I of order n has the property that _____ and _____.

IV. Applications of Matrix Operations (Pages 643–644)

What you should learn
How to use matrix operations to model and solve real-life problems

Matrix multiplication can be used to represent a system of linear equations. The system

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1 \\ a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2 \\ a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3 \end{cases}$$

can be written as the matrix equation _____, where A is the coefficient matrix of the system and X and B are column matrices.

Example 4: Consider the following system of linear equations.

$$\begin{cases} 2x_1 - x_2 + 3x_3 = -11 \\ x_1 - 3x_3 = -1 \\ -x_1 + 4x_2 + 2x_3 = 2 \end{cases}$$

Write this system as a matrix equation $AX = B$, and then use Gauss-Jordan elimination on the augmented matrix $[A : B]$ to solve for the matrix X.

Additional notes

Homework Assignment

Page(s)

Exercises