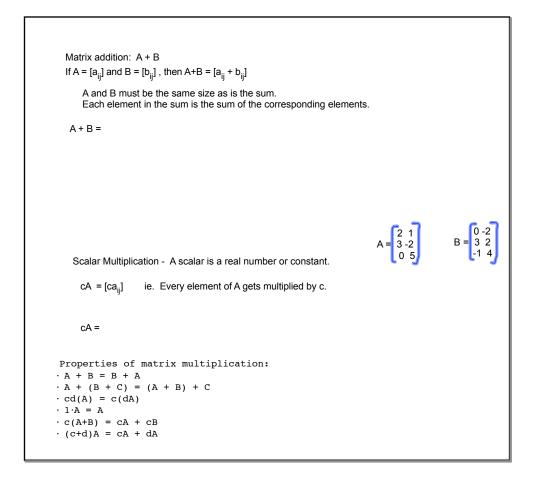
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In section 8.2 you will learn to:

- Decide whether two matrices are equal.
- Add and subtract matrices and multiply a matrix by a scalar.

In 8.2b you will learn to:

- Multiply two matrices.
- Set up an $n \times n$ Identity matrix.



Operations on a Matrix

Properties of matrix addition and scalar multiplication - A + B = B + A A + (B + C) = (A + B) + C cd(A) = c(dA) $1 \cdot A = A$ c(A+B) = cA + cB (c+d)A = cA + dA $A = \begin{bmatrix} 2 & 1 & -3 \\ 3 & -2 & 1 \\ 0 & 5 & -2 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & -2 & 1 \\ 3 & 2 & 5 \\ -1 & 4 & 0 \end{bmatrix}$ Example 1 a) A + B = b) A - B = c) 3A - 2B

Matrix Multiplication $A = [a_{ij}] an m \times n matrix \qquad B = [b_{ij}] an n \times p matrix$ $AB = [c_{ij}] an m \times p matrix$ where $c_{ij} =$ Example 2: Find AB if possible, then find BA $A = \begin{bmatrix} -1 & 3 \\ 4 & -5 \\ 0 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 2 \\ 0 & 7 \end{bmatrix}$ Notice: AB \neq BA $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 3 & 4 \end{bmatrix} =$

The Identity matrix:	
$I = \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & 0 & \dots & 0 \\ 0 & 0 & 1 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & 1 \end{bmatrix}$	
* Must be square * The diagonal has all 1s I _{jj} =1 * Zeros in all other positions	
Notice that $I \cdot A = A \cdot I = A$	
$\begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} =$	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix} =$

Matrix Multiplication Properties:

- 1. A(BC) = (AB)C
- 2. A(B+C) = AB + AC
- 3. (A+B)C = AC + BC
- 4. c(AB) = (cA)B = A(cB)
- 5. $I \cdot A = A \cdot I = A$

Example 3: Find AB if possible

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

Example 4: Find AB, BA, and A², if possible $A = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 3 \\ -3 & 1 \end{bmatrix}$ Put this system into matrix algebra form: A·X = C A is the Matrix of coefficients. X is the matrix of variables. C is the matrix of constants. $\begin{array}{rrrr} x & - & y & + & 4z & = & 17 \\ x & + & 3y & & = & -11 \\ & & & 2y & + & 5z & = & 0 \end{array}$