MATRIX OPERATIONS: GUIDED NOTES

Definitions

Matrix: A rectangular arrangement of terms into rows and columns; plural = matrices.

Element: Each term (or number) in the matrix.

Dimensions: Describe the size and shape of a matrix; the number of rows (m) by the number of columns (n); written as $m \times n$ and read as "m by n."

$$\text{let } A = \begin{bmatrix} 3 & 4 & 7 \\ -1 & 0 & 2 \end{bmatrix}$$

dimensions: 2 x 3 matrix

name of the matrix

2 is an element of matrix A that is in the 2nd row, 3rd column, often written a_{23}

Scalar multiplication: Multiplying each element of the matrix by the scalar value (the number in front of the matrix).

$$\text{Find } 3A = 3\begin{bmatrix} 3 & 4 & 7 \\ -1 & 0 & 2 \end{bmatrix} =$$

multiply each element by 3

*You can multiply any matrix by a scalar.

Examples

Perform the indicated matrix operations.

You can add or subtract matrices only if they share the same dimensions because you add or subtract corresponding elements.

1) $\begin{bmatrix} 5 & -2 \\ 7 & -6 \end{bmatrix} + \begin{bmatrix} -5 & -8 \\ 3 & 1 \end{bmatrix} =$

2) $(2)\begin{bmatrix} 4 \\ 7 \\ 1 \end{bmatrix} - 3\begin{bmatrix} 2 \\ 0 \\ 9 \end{bmatrix} =$

Multiplying Matrices

You can multiply matrices only when the number of columns of the first matrix equals the number of rows of the second matrix.

$$\text{let } A=\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} \quad \text{and} \quad B=\begin{bmatrix} p \\ q \\ r \end{bmatrix} \qquad \begin{matrix} A & \cdot & B & = & AB \\ m\times n & & n\times k & & m\times k \end{matrix}$$

dimensions: a 2 x 3 matrix multiplied by a 3 x 1 matrix will result in a 2 x 1 matrix

$$AB=\begin{bmatrix} ap+bq+cr \\ dp+eq+fr \end{bmatrix}$$

Examples

Perform the indicated matrix operations.

3) $\begin{bmatrix} 4 & 0 & 8 \\ 3 & -2 & 5 \end{bmatrix}\cdot\begin{bmatrix} -1 & 7 \\ 6 & 10 \\ -3 & 0 \end{bmatrix}=$

4) To calculate a basketball player's overall rating, a computer program multiplies the rating for each attribute by the weights of each attribute to yield an overall player rating (OVR).

$$[Attribute\ Ratings]\cdot[Weights]=[OVR]$$

Because we're going to calculate the ratings by hand, we'll look at a much smaller set of data and compare only two players, LeBron James and Michael Jordan. Let's say that LeBron James has an 84 defense rating, a 66 rebounding rating, and an 89 scoring rating. Michael Jordan has an 86 defense rating, a 68 rebounding rating, and an 86 scoring rating. The weights for those categories are as follows: 50%, 30%, and 20%. Use matrix multiplication to determine which player has the higher OVR.