OPERATIONS WITH MATRICES

FUNDAMENTALS

Reading the elements of a matrix.

Matrices can be given names just as vectors are given names. Typically, we use a capital A, B or C to represent a matrix.

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Given matrix B, identify the element at b_{24}.

$$B = \begin{bmatrix} 4 & 5 & 8 & -3 & 6 \\ -2 & -1 & 0 & 4 & 5 \\ 10 & 18 & -20 & -3 & 4 \\ 2 & 1 & 7 & 9 & 8 \end{bmatrix}$$

Two matrices A and B are equal if and only if their corresponding entries are equal.

Given $A = B$

$$A = \begin{bmatrix} 4 & 2 \\ 1 & 7 \end{bmatrix} \qquad B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$$

Find $b_{11} =$ $b_{12} =$ $b_{21} =$ $b_{22} =$

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

MATRIX OPERATIONS (ADDITION/SUBTRACTION)

In order to add or subtract any two matrices their orders must match.

Therefore, if matrix $A = \begin{bmatrix} 2 & 5 & 3 \\ 8 & -4 & 0 \end{bmatrix}$ and matrix $B = \begin{bmatrix} 2 & -1 \\ 8 & 0 \\ 5 & -3 \end{bmatrix}$

$A + B$ does not exist.

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

Find A + B

SCALAR MULTIPLIERS

$$\text{If matrix } A = \begin{bmatrix} 2 & 1 \\ -5 & 3 \end{bmatrix}$$

Find 3A =

Given matrix $A = \begin{bmatrix} 1 & -5 \\ 2 & 10 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 12 \\ -3 & -4 \end{bmatrix}$

Find: 4A – 2B

Given matrix $A = \begin{bmatrix} 1 & -5 \\ 2 & 10 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 12 \\ -3 & -4 \end{bmatrix}$

If matrix $A + X = 2B$,

Find matrix X

MATRIX OPERATIONS CONTINUED

MULTIPLYING MATRICES

In order to multiply two matrices together you must look at the order of the matrix. The order of the matrices will tell if you can multiply them together.

If, for example the order of matrices A and B are as follows, you can multiply.

Matrix A	Matrix B
4 x 3	3 x 2

What tells you whether or not you can multiply two matrices together?

What will the product of the matrices look like?

The commutative property of multiplication states: $A \cdot B = B \cdot A$

Does this property hold true with matrices? Why or why not?

Given matrix $A = \begin{bmatrix} 2 & 5 \\ 1 & 4 \end{bmatrix}$ and matrix $B = \begin{bmatrix} 3 & -1 & 5 \\ 8 & 6 & 2 \end{bmatrix}$

Find A·B and B·A

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

Find a) $A \cdot B$ b) $B \cdot A$ c) A^2 d) B^2

SYSTEMS OF EQUATIONS WRITTEN AS MATRIX EQUATIONS

Simplify the following:

$$\begin{bmatrix} 2 & 3 & -5 \\ 6 & -8 & 4 \\ 1 & 12 & -2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 2 \\ 7 \end{bmatrix}$$