Section 10.2 Addition and Subtraction of Matrices

Learning Objective: Add and subtract matrices, know the basic properties of matrices

We can also use a matrix to denote the information from a table. For example, **NBA Central Standings** (https://sports.yahoo.com/nba/teams/cleveland/stats/)

NBA Central Standings

	W	L	Pct	GB
Chicago	33	19	.635	0.0
Cleveland	32	21	.604	1.5
Milwaukee	32	21	.604	1.5
Indiana	19	35	.352	15.0
Detroit	12	40	.231	21.0

$$\Rightarrow M = \begin{bmatrix} 33 & 19 & .635 & 0.0 \\ 32 & 21 & .604 & 1.5 \\ 32 & 21 & .604 & 1.5 \\ 19 & 35 & .352 & 15.0 \\ 12 & 40 & .231 & 21.0 \end{bmatrix}$$

Some Notes about Matrices:

- Matrices are often named with capital letters.
- Matrices are classified by size – the number of rows and columns they contain
- A matrix with m rows and n columns is known as a "m by n" matrix, often written $m \times n$
- The number of rows is always given first.
- A matrix with the same number of rows as columns is called a square matrix.
- A matrix with only one row is called a row vector and A matrix with only one column is called a column vector.

Matrix Equality
Two matrices are equal if they are the same size and if each pair of corresponding elements is equal.

Examples:

Example 1: Determine the size of each matrix below.

a) $A = \begin{bmatrix} 3 & 11 \\ 1 & -5 \\ 2 & 7 \end{bmatrix}$

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

c) $C = \begin{bmatrix} 2 & 6 & 5 & -1 & 9 \end{bmatrix}$

d) $D = \begin{bmatrix} -5 \\ 4 \\ 7 \\ 0 \end{bmatrix}$

Adding / Subtracting Matrices
The sum of two $m \times n$ matrices A and B is the $m \times n$ matrix $A + B$ in which each element is the sum of the corresponding elements of A and B. Similarly, the difference of two $m \times n$ matrices A and B is the $m \times n$ matrix $A - B$ in which each element is the difference of the corresponding elements of A and B.

Example 2: Find the values of the variables in each equation.

a) $\begin{bmatrix} 2 & 5 \\ -1 & 8 \end{bmatrix} = \begin{bmatrix} 2 & x \\ z & y \end{bmatrix}$

b) $\begin{bmatrix} x-1 & s+3 & 4 \\ -5 & 17 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 7 & t \\ -5 & w & 3-y \end{bmatrix}$

Example 3: Perform the indicated operations, where possible

a) $\begin{bmatrix} 8 & -3 & 0 \\ 1 & 5 & -6 \end{bmatrix} + \begin{bmatrix} -3 & 2 & 4 \\ 13 & -19 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 5 & -8 \\ -7 & 0 \end{bmatrix} - \begin{bmatrix} 4 & -2 \\ 3 & 8 \end{bmatrix}$

Example 4: Perform the indicated operations, where possible

a) $\begin{bmatrix} 0 & -4 \\ -9 & -1 \\ 10 & 1 \\ 4 & 3 \end{bmatrix} - \begin{bmatrix} 2 & -2 \\ 8 & -10 \\ -3 & 7 \\ -7 & 5 \end{bmatrix}$

b) $\begin{bmatrix} -2 & -5 \\ 6 & 9 \end{bmatrix} + \begin{bmatrix} 10 & -3 \\ -1 & 3 \end{bmatrix} - \begin{bmatrix} 1 & 8 \\ 0 & 7 \end{bmatrix}$