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9-1 & 9-2 Notes

Sec 1 H | **Matrix Operations** | **Unit 9**

- **Matrix:** a rectangular arrangement of numbers in rows & columns

Rows → $\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$ ← Column

- **Dimensions:**

Rows x Columns $\quad 2 \times 3$

- **Row Matrix:**

a matrix with only 1 row $\quad 1 \times 4 \quad \begin{bmatrix} 4 & 2 & 7 & -2 \end{bmatrix}$

- **Column Matrix:**

a matrix with only 1 column $\quad 3 \times 1 \quad \begin{bmatrix} 4 \\ 7 \\ 9 \end{bmatrix}$

- **Square Matrix:**

Same # of Rows & columns $\quad 2 \times 2 \quad \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

State the dimensions of each matrix below.

Ex. 1:

$$\begin{bmatrix} 2 & 5 & 9 & -1 \\ -2 & 6 & 3 & 0 \end{bmatrix}$$

2×4

Ex. 2:

$$\begin{bmatrix} 7 \\ 4 \\ 11 \end{bmatrix}$$

3×1

Ex. 3:

$$\begin{bmatrix} 1 & 0 \\ 9 & 4 \\ -6 & 22 \end{bmatrix}$$

3×2

When matrices are of the same dimension and are set equal to each other, the corresponding entries are equal.

Solve for the variables.

Ex. 4:

$$\begin{bmatrix} 3m & 4p \\ 13 & 0 \end{bmatrix} = \begin{bmatrix} 27 & 64 \\ 2n-7 & 0 \end{bmatrix}$$

$3m = 27$

$m = 9$

$4p = 64$

$p = 16$

$2n - 7 = 13$

$+7 \quad +7$

$2n = 20$

$n = 10$

Ex. 5:

$$\begin{bmatrix} 4x-6 & 6 & 3z+12 \end{bmatrix} = \begin{bmatrix} -10 & 5y & 7 \end{bmatrix}$$

$4x - 6 = -10$

$+6 \quad +6$

$4x = -4$

$x = -1$

$\frac{5y}{5} = \frac{6}{5}$

$y = \frac{6}{5}$

$3z + 12 = 7$

$-12 \quad -12$

$\frac{3z}{3} = \frac{-5}{3}$

$z = -5/3$

$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $B = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$

2x2 2x2

Adding Matrices: $A + B$

Matrices HAVE to be the same dimensions

$\begin{bmatrix} a+e \\ R1C1 & b+f \\ & R1C2 \\ c+g \\ R2C1 & d+h \\ & R2C2 \end{bmatrix}$

Subtracting Matrices: $B - A$

$\begin{bmatrix} e-a & f-b \\ g-c & h-d \end{bmatrix}$

Scalar Multiplication: kA

$k\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} ka & kb \\ kc & kd \end{bmatrix}$

Ex. 6: Perform the indicated operation, if possible. If not possible, state the reason.

$A = \begin{bmatrix} 16 & 2 \\ -9 & 8 \end{bmatrix}$, $B = \begin{bmatrix} -4 & -1 \\ -3 & -7 \end{bmatrix}$, and $C = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$

2x2 2x2 2x1

a. $A + B$ $\begin{bmatrix} 12 & 1 \\ -12 & 1 \end{bmatrix}$

b. $B - A$ $\begin{bmatrix} -20 & -3 \\ 6 & -15 \end{bmatrix}$

c. $B - C$

Not the same dimensions

Ex. 7: Perform the indicated operation, if possible. If not possible, state the reason.

$$R = \begin{bmatrix} -12 & 8 & 6 \\ -16 & 4 & 19 \end{bmatrix}$$

$$\begin{bmatrix} -60 & 40 & 30 \\ -80 & 20 & 95 \end{bmatrix}$$

a. Find $5R$

Ex. 8: Perform the indicated operation, if possible. If not possible, state the reason.

$$A = \begin{bmatrix} -9 & 12 \\ 2 & -6 \end{bmatrix}, \quad B = \begin{bmatrix} -4 & -8 \\ 2 & -3 \end{bmatrix}$$

$$-4B = \begin{bmatrix} 16 & 32 \\ -8 & 12 \end{bmatrix}$$

$$-3A = \begin{bmatrix} 27 & -36 \\ -6 & 18 \end{bmatrix}$$

a. Find $-4B + -3A$

$$\begin{bmatrix} 43 & -4 \\ -14 & 30 \end{bmatrix}$$