Admin Notes / Agenda

- Parker review
- PSL review - memo contetn and questions about calculations
- Warm Up Problems
- Lecture
- Board sheets

Warm Up

Consider the matrix below:

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

Answer the following questions:

1. What are the dimensions of matrix M?
2. List all the elements in the second row of M.
3. Write the element in the 1st row, 3rd column using subscript notation (e.g., a_{12}).
4. How many rows and how many columns does M have?

Summary of Key Terms and Operations

- **Matrix:** A matrix is a rectangular array of numbers arranged in rows and columns. A matrix with m rows and n columns is called an $m \times n$ *matrix*.
- **Matrix Notation:** A matrix is labeled with a capital letter (e.g., A, B), and its elements with subscripts. For example:

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

  where a_{ij} is the entry in the ith row and jth column.
- **Rows and Columns:**
  - A *row* is a horizontal selection of elements in a matrix.
  - A *column* is a vertical selection of elements in a matrix.
- **Vectors as Matrices:** A vector in component form can be written as a matrix:

  - A *row vector* is a $1 \times n$ matrix, e.g. $\begin{bmatrix} 2 & -1 & 5 \end{bmatrix}$
  - A *column vector* is an $n \times 1$ matrix, e.g. $\begin{bmatrix} 2 \\ -1 \\ 5 \end{bmatrix}$

  Both forms represent the same vector, just written differently for different operations.

- **Matrix Addition:** Two matrices must have the same dimensions. Add corresponding entries:

$$A + B = \begin{bmatrix} a_{11} + b_{11} & a_{12} + b_{12} \\ a_{21} + b_{21} & a_{22} + b_{22} \end{bmatrix}$$

- **Matrix Subtraction:** Subtract corresponding entries (same-sized matrices only):

$$A - B = \begin{bmatrix} a_{11} - b_{11} & a_{12} - b_{12} \\ a_{21} - b_{21} & a_{22} - b_{22} \end{bmatrix}$$

- **Scalar Multiplication:** Multiply each entry of a matrix by a real number c:

$$cA = \begin{bmatrix} ca_{11} & ca_{12} \\ ca_{21} & ca_{22} \end{bmatrix}$$

- **Dot Product as Matrix Multiplication:** The dot product of two vectors can be computed by multiplying a $1 \times n$ row vector by an $n \times 1$ column vector:

$$\begin{bmatrix} u_1 & u_2 & u_3 \end{bmatrix}$$