

3.1: Intro to Matrices

vocab: matrix ← singular
matrices ← plural.

Matrix: a table/array of numbers

$$A = \begin{bmatrix} 1 & 0 & 4 \\ 5 & 1 & 0 \end{bmatrix} \begin{matrix} \text{--- rows} \\ \text{---} \\ \text{---} \end{matrix}$$

1 1 1
columns

Dimensions of
A are 2x3.

$$-A = \begin{bmatrix} -1 & 0 & -4 \\ -5 & -1 & 0 \end{bmatrix}$$

Numbers in a matrix: entries
elements.

$$a_{1,3} = 4 ; a_{2,2} = 1 ; a_{2,1} = 5$$

$$B = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

zero matrix

3x3 ← square matrix

Q: Are all zero matrices equal?

No $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \neq \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

For matrices to be equal

- same dimension
- same entries

ex1: solve

$$\begin{bmatrix} x & 3 & (2x-1) \\ y & 4 & 4y \end{bmatrix} = \begin{bmatrix} (2x-4) & z & 7 \\ 1 & (w+1) & (3y+1) \end{bmatrix}$$

$$\begin{cases} \rightarrow x = 2x - 4 \Rightarrow 4 = x \\ 3 = z \\ \rightarrow 2x - 1 = 7 \Rightarrow 2x = 8 \Rightarrow x = 4 \end{cases}$$

$$\begin{cases} \rightarrow y = 1 \\ 4 = w + 1 \Rightarrow w = 3 \\ \rightarrow 4y = 3y + 1 \Rightarrow y = 1 \end{cases}$$

Transpose: swap rows & cols.

$$A = \begin{bmatrix} 1 & 0 & 4 \\ 5 & 1 & 0 \end{bmatrix}$$

$$A^T = \begin{bmatrix} 1 & 5 \\ 0 & 1 \\ 4 & 0 \end{bmatrix}$$

Algebra of matrices

$$C = \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix} \quad \text{and} \quad D = \begin{bmatrix} 11 & -7 \\ -3 & -5 \end{bmatrix}$$

ex 2:

$$(a) \quad C + D = \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix} + \begin{bmatrix} 11 & -7 \\ -3 & -5 \end{bmatrix} = \begin{bmatrix} 9 & -3 \\ 0 & -6 \end{bmatrix}$$

$$(b) \quad C - D = \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix} - \begin{bmatrix} 11 & -7 \\ -3 & -5 \end{bmatrix} = \begin{bmatrix} -13 & 11 \\ 6 & 4 \end{bmatrix}$$

$$(c) \quad 2C = 2 \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix} = \begin{bmatrix} -4 & 8 \\ 6 & -2 \end{bmatrix}$$

$$(d) \quad 2C + 3D = 2 \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix} + 3 \begin{bmatrix} 11 & -7 \\ -3 & -5 \end{bmatrix} = \begin{bmatrix} 29 & -13 \\ -3 & -17 \end{bmatrix}$$