Vectors

Type Of Vectors

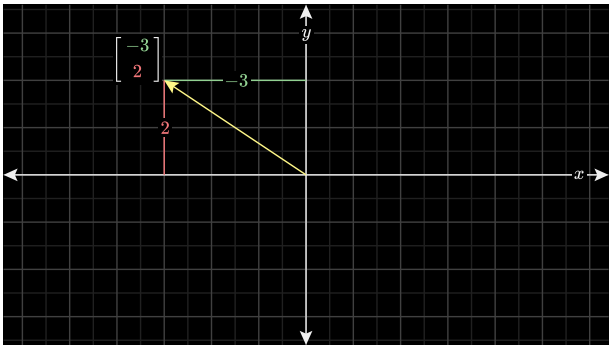
1. row vector or vector transpose

v = [a, b]

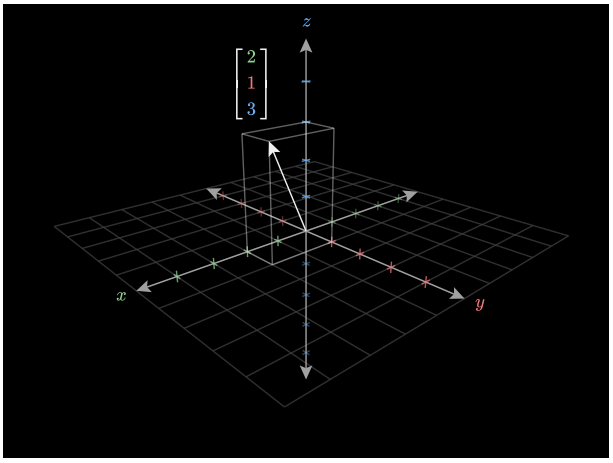
2. column vector

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \end{pmatrix} \begin{pmatrix} 1 \\ -3 \end{pmatrix} \begin{pmatrix} -2 \\ -2 \end{pmatrix}$$

If I have v = [-3, 2], it starts from the origin and points to (4, 6).



In three dimensions, if I have v = [2, 1, 3],



Vectors Norm

The norm is the magnitude of the vector

Type of norm

1. norm 1 L1 : absolute sum

$$\|\boldsymbol{x}\|_1 := \sum_{i=1}^{n} |x_i|\,.$$

2. norm 2 L2 (**Euclidean norm**)

$$\|\boldsymbol{x}\|_2 := \sqrt{x_1^2 + \cdots + x_n^2}.$$

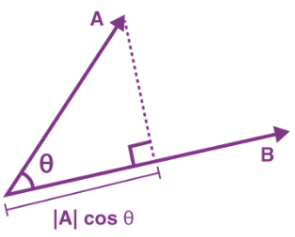
3. norm max (infinity)

$$\|\mathbf{x}\|_\infty := \max_i |x_i|\,.$$

Vector Operations

Dot product

1. **A . B = |A| |B| cosθ**



Sometimes, I don't have the angle between the two vectors.

Then, suppose I convert any vector to a unit vector, for example, vector A.

A . B = |A| |B| cosθ

|A| = 1

THEN :

A(unit vector) . B = |B| cosθ

THEN :

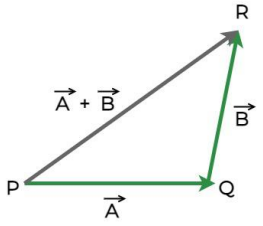
I can find the **A . B**

2. Multiply

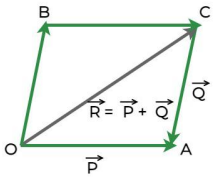
$$a.b = (a_1\hat{i} + a_2\hat{j} + a_3\hat{k}).(b_1\hat{i} + b_2\hat{j} + b_3\hat{k})$$

Vector Addition

Triangle Law of Vector Addition



Parallelogram Law of Vector Addition



Scaling