Part 1 Vector

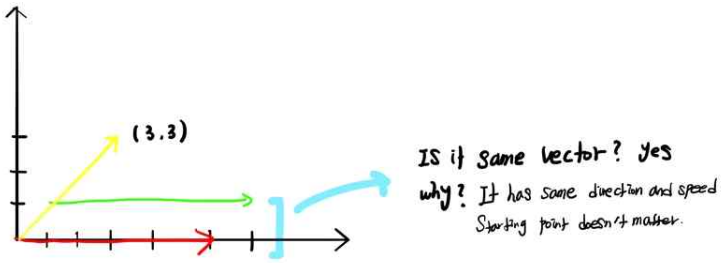
#What is vector

vector : magnitude of direction

ex)magnitude : 5mph speed(scalar)

direction : east

=vector is velocity



$\overrightarrow{V1} = (5,0) = \begin{bmatrix} 5 \\ 0 \end{bmatrix}$

$\overrightarrow{V2} = (3,3) = \begin{bmatrix} 3 \\ 3 \end{bmatrix}$

#What is real coordinate space

R^2=2-dimensional real coordinate space

=all possible real-valued two-tuple

ex) $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$

R^3=3-dimensional real coordinate space

=all possible real-valued three-tuple

ex) $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

$\overrightarrow{X} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

$\overrightarrow{X} \in R^3$

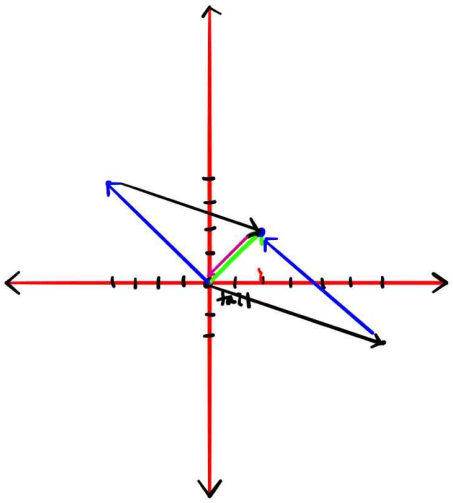
$\overrightarrow{X} \notin R^2$

#Adding vector

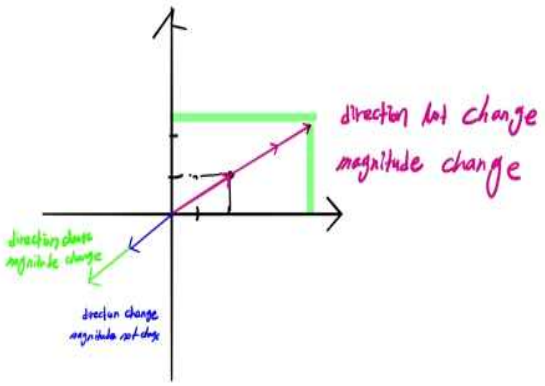
$\vec{a} = \begin{bmatrix} 6 \\ -2 \end{bmatrix}$ $\vec{b} = \begin{bmatrix} -4 \\ +4 \end{bmatrix}$

$\vec{a} + \vec{b} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$

visualization



#Multiply a vector by a scalar



$\vec{a} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

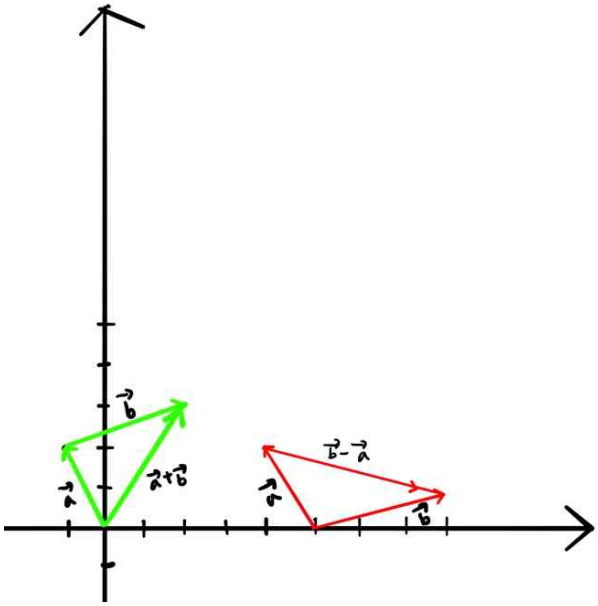
$3\vec{a} = \underset{\text{scalar}}{3}\begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \cdot 2 \\ 3 \cdot 1 \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \end{bmatrix}$

Scaled up vector.

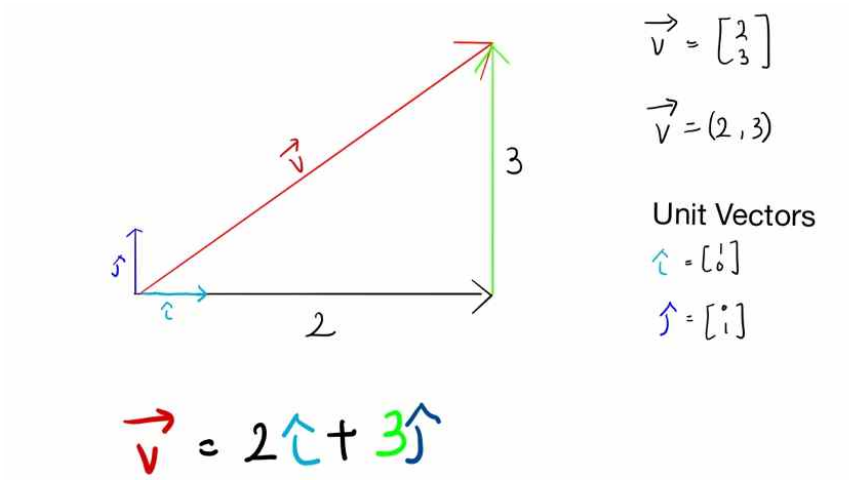
$-1\vec{a} = -1\begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \cdot 2 \\ -1 \cdot 1 \end{bmatrix} = \begin{bmatrix} -2 \\ -1 \end{bmatrix}$

$-2\vec{a} = -2\begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} -2 \cdot 2 \\ -2 \cdot 1 \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \end{bmatrix}$

#Addition and subtraction of vectors



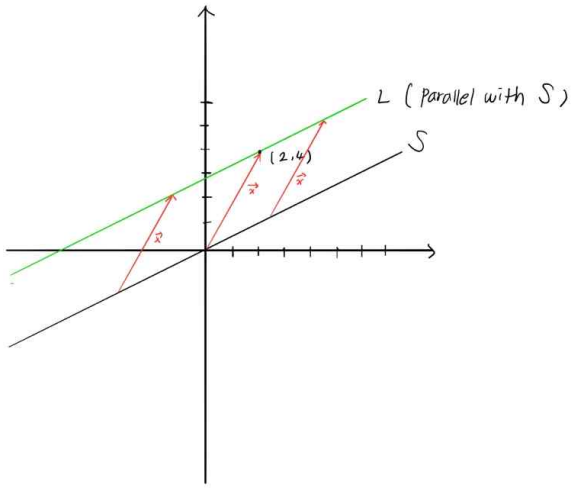
#Unit Vecotr notation



Unit vecotr : size 1 vector (ignore the size, present the direction)
All of vectors can be translated by normalization.
<Normalization>

$$\frac{\overrightarrow{V}}{size\,of\ \overrightarrow{V}} = Unit\ \overrightarrow{V}$$

#parametric representations of Lines



$\vec{V} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

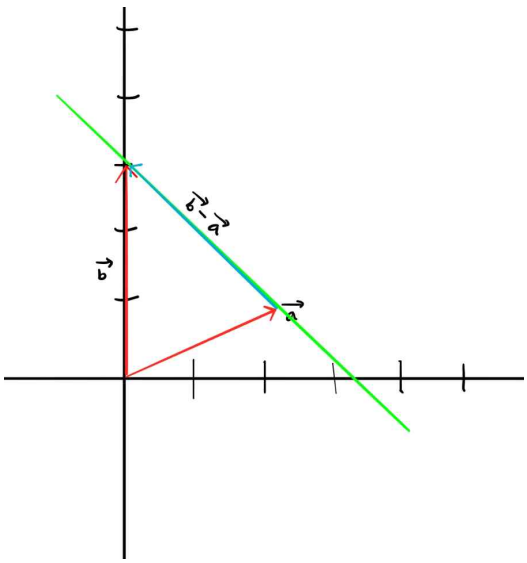
$\vec{S} = \{c\vec{V} \mid c \in R\}$

a parallel line that goes through point over (2,4)

$\vec{X} = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$

$L = \{\vec{X} + t\vec{V} \mid t \in R\}$

Ex)



$\vec{a} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

$\vec{b} = \begin{bmatrix} 0 \\ 3 \end{bmatrix}$

$L = \{\vec{b} + t(\vec{b} - \vec{a}) \mid t \in R\}$

$L = \{\vec{a} + t(\vec{b} - \vec{a}) \mid t \in R\}$

so1) $L = \left\{ \begin{bmatrix} 0 \\ 3 \end{bmatrix} + t \begin{bmatrix} -2 \\ +2 \end{bmatrix} \mid t \in R \right\}$