Part 2 Linear Combination and Span

$\overrightarrow{v_1}, \overrightarrow{v_2}, \ldots \overrightarrow{v_n} \in R^2$

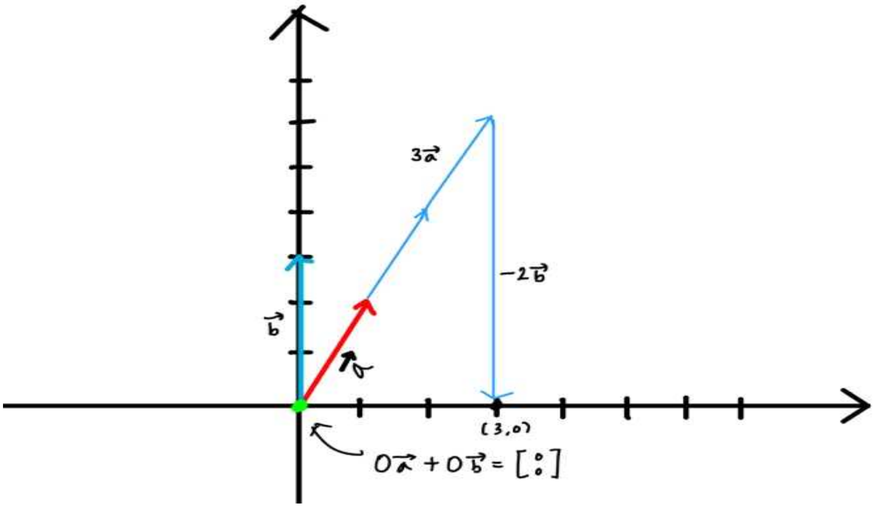
$c_1\overrightarrow{v_1} + c_2\overrightarrow{v_2} + \ldots + c_n\overrightarrow{v_n} \mid c_1 \sim c_2 \in R$

Adding the vectors and just scale up by some scaling factor.

Ex)

$\vec{a} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ $\vec{b} = \begin{bmatrix} 0 \\ 3 \end{bmatrix}$

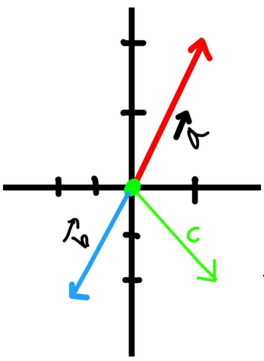
$0\vec{a} + 0\vec{b} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ $3\vec{a} + -2\vec{b} = \begin{bmatrix} 3-0 \\ 6-6 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \end{bmatrix}$



Linear combinations can represent all vectors in two-dimensional coordinates.

Span of the Vector A and B : span($\vec{a}, \vec{b}$)$= R^2$

But if two vectors in colinear, it cannot represent all vectors in R^2



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

Is it possible to represent $\vec{c}$ by using $\vec{a}, \vec{b}$? NO prove 1)

if $\vec{a} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ $\vec{b} = \begin{bmatrix} 0 \\ 3 \end{bmatrix}$ and $\overrightarrow{X} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ $: represent\, aribitary\, point\, X \in R^2$

$c_1\vec{a} + c_2\vec{b} = \vec{x}$

$c_1\begin{bmatrix} 1 \\ 2 \end{bmatrix} + c_2\begin{bmatrix} 0 \\ 3 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

$c_1 = x_1$

$c_2 = \frac{1}{3}(x_2 - 2x_1)$

looking to get th the point 2,2

$c_1 = 2$

$c_2 = \frac{1}{3}(2-4) = \frac{-2}{3}$

$\therefore 2\vec{a} - \frac{2}{3}\vec{b} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$