Section 1.1: The Geometry and Algebra of vectors

Tuesday, September 7, 2021 11:57 AM

vectors in the plane:

a vector is a directed line segment that corresponds to a displacement from one point A to another point B

in general, A and B have coordinates

(x_1, y_1) and (x_2, y_2) for 2D vectors

points have round brackets

then vector $\vec{AB}$ can be written as

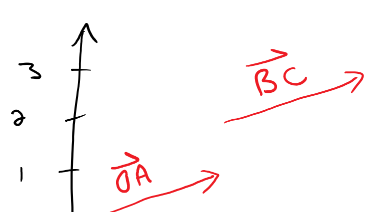
$$[x_2 - x_1, y_2 - y_1]$$

written as a row vector $[3, -2]$

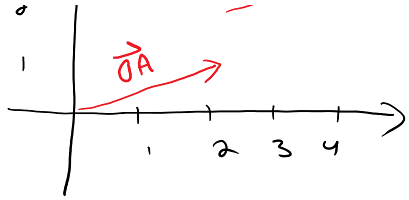
can also write as column vector $\begin{bmatrix} 3 \\ -2 \end{bmatrix}$

2021/09/08

equality of vectors



these two vectors are <u>equal</u>



equal

vector $\vec{OA}$ is said to be in standard position since tail is at the origin

one convention:

$$\vec{OA} = \vec{A}$$

O for origin

notation: in 2D:

$$\vec{0} = [0, 0]$$

the zero vector

← hard to draw! but a perfectly good vector

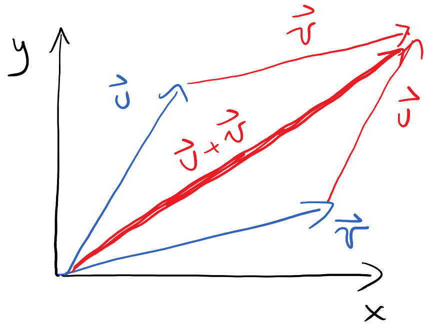
the set of all vectors with two components in written

$\mathbb{R}^2$ (pronounced "R two")

$\mathbb{R}^3$ - three components

$\mathbb{R}^n$ - n components

vector addition:



$\vec{u}+\vec{v} = [\,u_1+v_1\,,\ u_2+v_2\,]$

note: order doesn't matter

scaling a vector:

$\vec{v}$ is a vector

c is a constant

if $\vec{v} = [v_1, v_2]$, then $c\vec{v} = [cv_1, cv_2]$

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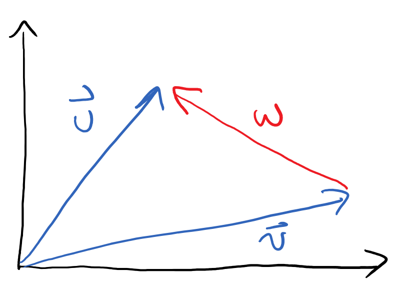
vector subtraction:



$\vec{v} + \vec{w} = \vec{u}$

$\vec{w} = \vec{u} - \vec{v}$

linear combination of vectors: definition is on handout

example: $\vec{w} = -3\begin{bmatrix}1\\1\end{bmatrix} + 2\begin{bmatrix}0\\2\end{bmatrix}$

coefficients

then $\vec{w}$ is a linear combination of $\begin{bmatrix}1\\1\end{bmatrix}$ and $\begin{bmatrix}0\\2\end{bmatrix}$