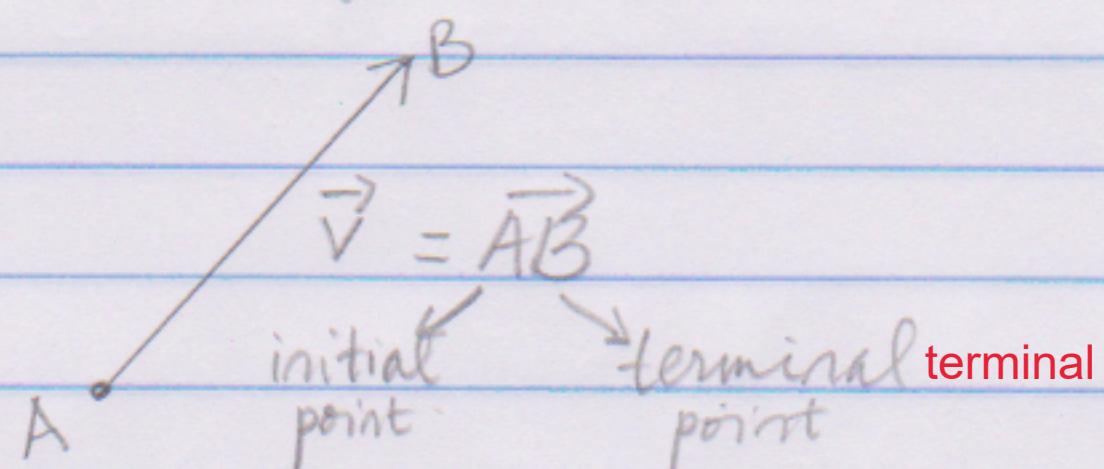


$\Rightarrow x = -1$ and $y = -1$ make the two points equal.

Vectors in \mathbb{R}^2 and \mathbb{R}^3

Many physical quantities, such as temperature and speed, possess only magnitude. These quantities can be represented by real numbers and are called "scalars".

On the other hand, there are quantities such as force and velocity, that have both a "magnitude" and a "direction." These quantities that have both magnitude and direction are called vectors. Usually vectors are represented as an arrow. They have an initial point and a terminal point.



In \mathbb{R}^2 , vectors are described as a pair of real numbers.

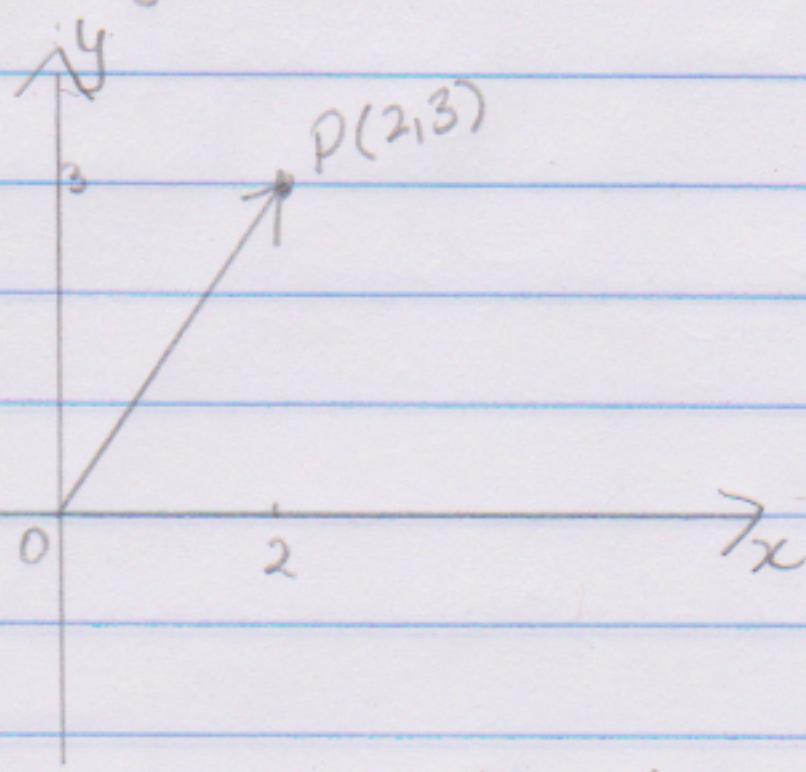
This pair of numbers that describes the vector are the coordinates of the terminal point of the vector when the initial point is at the origin.

So the vector $\vec{v} = (2, 3)$ can be represented on the xy-coordinate system as follows.

We say the components of \vec{v} are $(2, 3)$ or write

$$\vec{v} = (2, 3)$$

We say the coordinate of P are $(2, 3)$ and write $P(2, 3)$



$$\vec{v} = \overrightarrow{OP} \quad \text{where } O \text{ is the origin and } P(2, 3)$$