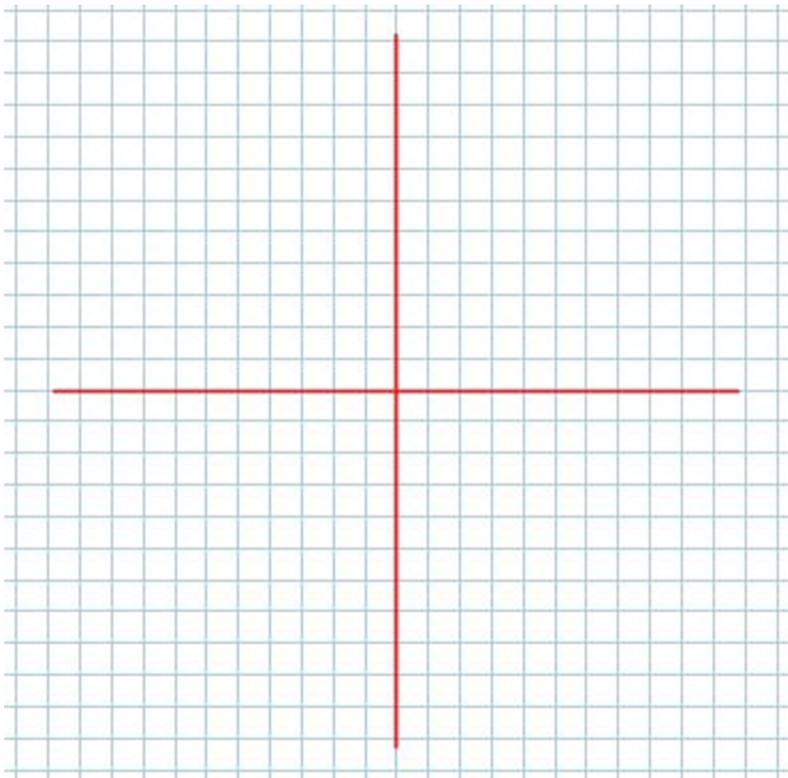
6.6 Algebraic Operations with Vectors in $\mathbb{R}^2$

We will begin by considering two **Very Special** vectors.

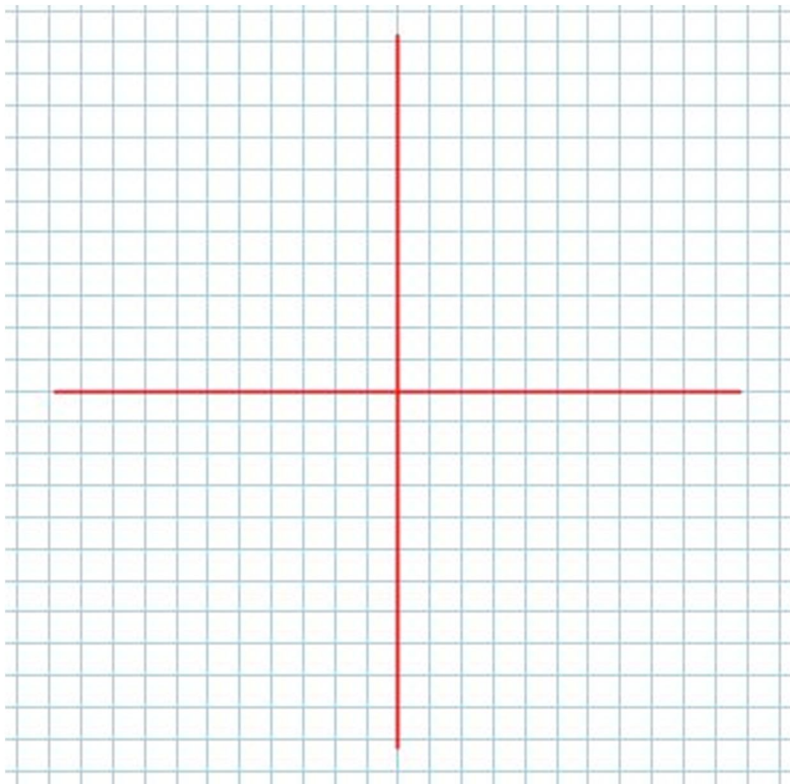


The Standard Unit Vectors are **beautiful** because they are so easy to "scale". For example, consider the vector $\vec{a} = (7,0)$. We can write

Another example would be rewriting $\vec{b} = (0.-3)$ as

Consider the general position vector for $\mathbb{R}^2$ $\overrightarrow{OP} = (m, n)$, (where $m, n \in \mathbb{R}$).

A picture:



Huge Insight

We say **ANY** vector in $\mathbb{R}^2$ can be **uniquely** written as a **Linear Comination** of the standard unit vectors.

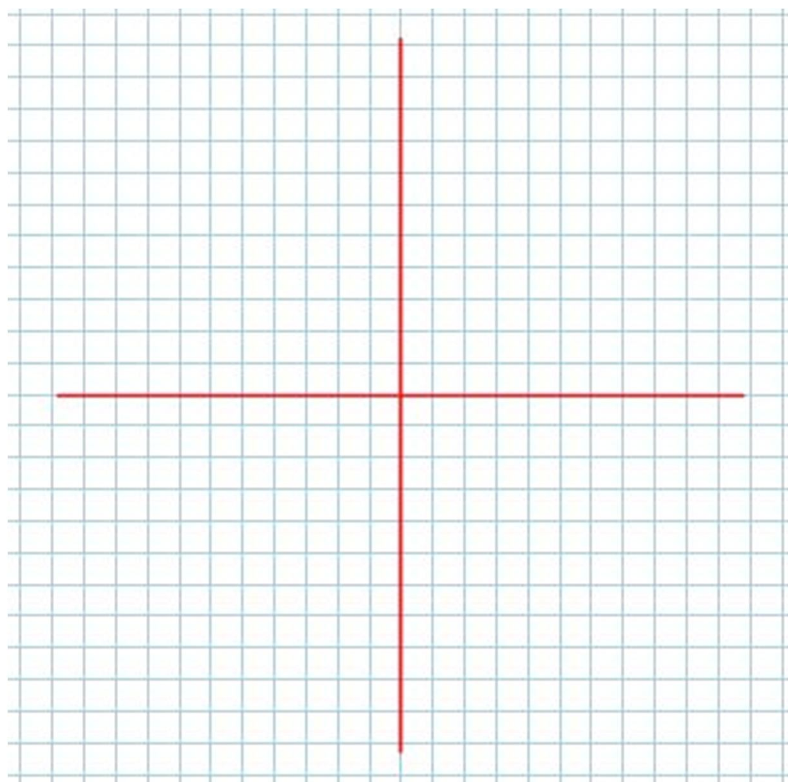
Definition 6.6.1

Adding Vectors Algebraically

Example 6.6.1

Given $\overrightarrow{OA}=(3,1)$, and $\overrightarrow{OB}=(2,2)$, determine $\overrightarrow{OA}+\overrightarrow{OB}$

Picture



Note:

We add vectors **component-wise**

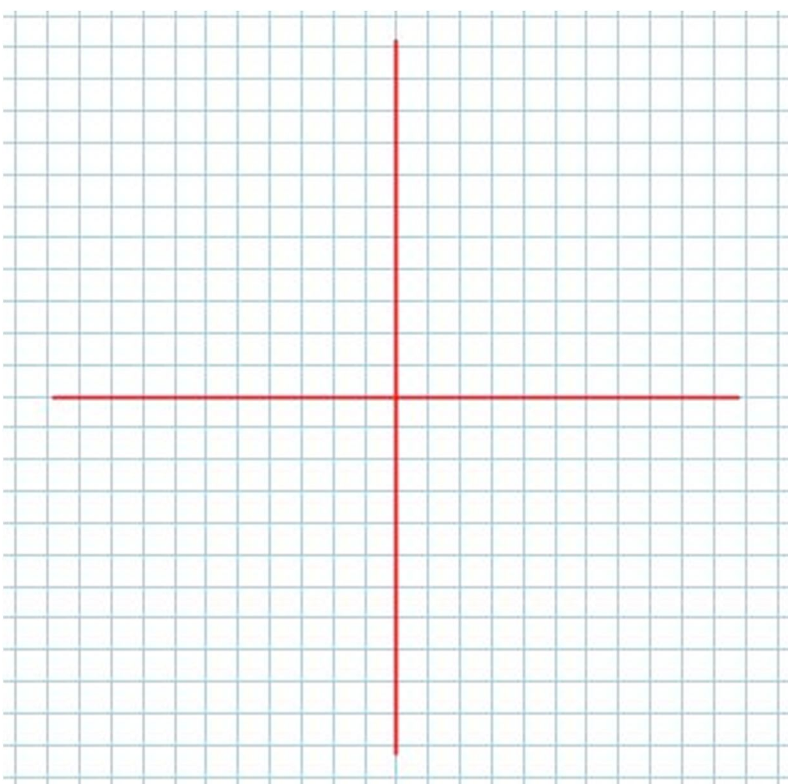
Example 6.6.2

Given $\vec{a} = (3,-5)$, and $\vec{b} = (-8,-2)$, determine:

i) $\vec{a} + \vec{b}$ ii) $\vec{b} - \vec{a}$

Example 6.6.3 (*this is an important one…well they all are, but this one especially)*

Given the **points** $A(2,-1)$ and $B(3,2)$, draw vector $\overrightarrow{AB}$ and determine its **components**.



Magnitude of a vector algebraically

Consider the position vector $\overrightarrow{OA} = (2,5)$.

In general, for some vector $\overrightarrow{AB}$ with endpoints $A(x_1, y_1)$ and $B(x_2, y_2)$

Consider now a position vector $\vec{a} = (x, y)$

Example 6.6.4

Given $\vec{a} = (3,-1)$ and $\vec{b} = (-2,4)$ find $\left|\vec{a} - 2\vec{b}\right|$.

Class/Homework for Section 6.6

Pg. 324 – 326 #1 – 17