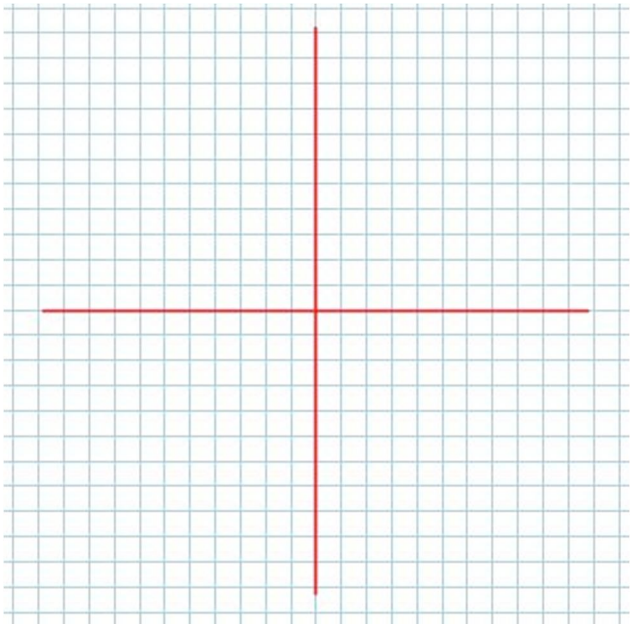
6.2 Vector Addition (and subtraction)

Consider the following:

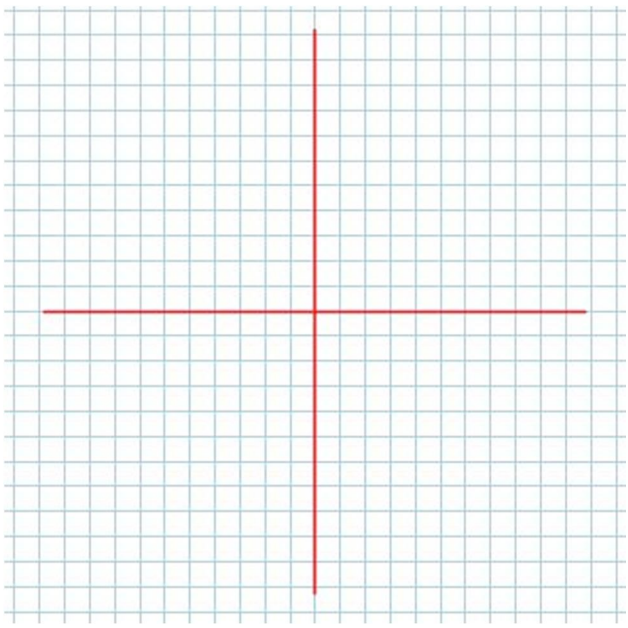
> Fred walks $2.5km$ E , and then turns 30° toward the North and walks a further $3.2km$.
> How far is Fred from his starting point, and in what direction?
>
> **A Vector is the solution to this problem!**

There are two approaches to a “geometric representation” of Fred’s situation:

Position Diagram



Triangle Diagram



Vector Addition

Parallelogram Law

Triangle Law

Solving Fred's Problem

Note: We can use **bearings** to describe direction. Bearings measure angles from N (0 degrees) rotating clockwise. For example, a bearing of 200^{o} looks like:

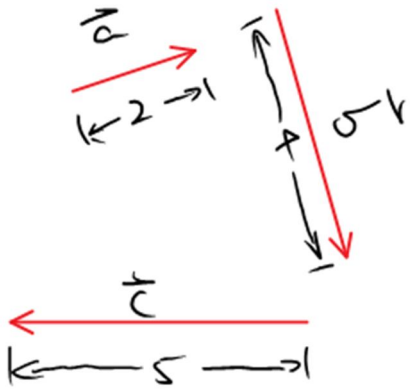
Vector Subtraction

We can write $\vec{a}-\vec{b}$ as $\vec{a}+\left(-\vec{b}\right)$ and simply use "vector addition".

Example 6.2.1

Given vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$, draw:

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



Note: A **KEY** aspect of vectors is about to be presented to you…pay attention!!

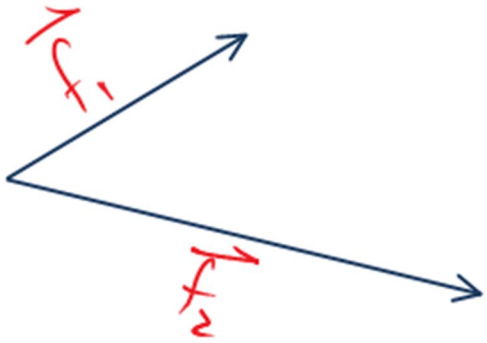
Consider $\vec{a}+\left(-\vec{a}\right)$

One final note (related to the zero vector):

The Equilibrant (an idea from physics)

Consider the position diagram of forces acting on a (point) body:
Draw the **resultant** force, and ask yourself the intriguing question:

"What force would be needed to keep the body from moving?"



Example 6.2.2

Write as a single vector: $\overrightarrow{AB} + \overrightarrow{BC} - \overrightarrow{DC}$ (hint: draw a picture)

Example 6.2.3

From your text: Pg. 291 #9a

In still water, Maria can paddle at the rate of 7 km/h. The current in which she paddles has a speed of 4 km/h.

a. At what velocity does she travel downstream?

Example 6.2.4

Two vectors $\vec{a}$ $\left(\left|\vec{a}\right| = 3cm\right)$ and $\vec{b}$ $\left(\left|\vec{b}\right| = 4cm\right)$ have an angle between them of 80°.

Determine $\left|\vec{a} + \vec{b}\right|$.

Class/Homework for Section 6.2

Pg. 290 – 292 #1 – 14 (Ex 4 on Pg. 287 is awesome)