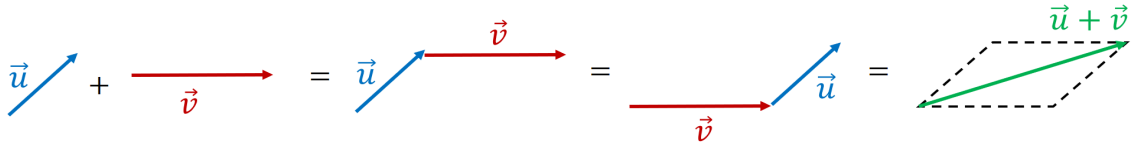
Section 2.2. Rules for Manipulating Vectors

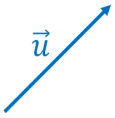
"Definition." The *sum* of two vectors is determined by placing them "tail" to "head":

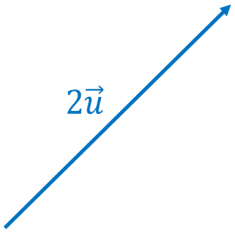


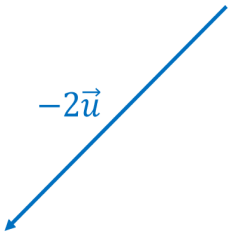
Note. "Clearly" $\vec{u}+\vec{v}=\vec{v}+\vec{u}$ and $(\vec{u}+\vec{v})+\vec{w}=\vec{u}+(\vec{v}+\vec{w})$.

Note. We denote the magnitude of $\vec{u}$ as $|\vec{u}|$.

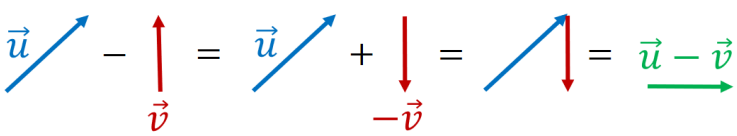
Definition. We define a scalar a times a vector $\vec{u}$, $a\vec{u}$, as the vector of magnitude $|a||\vec{u}|$ in (1) the same direction as $\vec{u}$ if $a \geq 0$, and (2) in the opposite direction of $\vec{u}$ if $a < 0$.

Example. If 

then 

and 

Note. For vector subtraction we have:



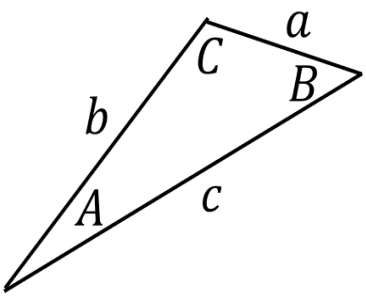
Definition. A *unit vector* is a vector of length 1.

Note. For any nonzero vector $\vec{u}$, $\frac{1}{|\vec{u}|}\vec{u}$ is a unit vector in the same direction as $\vec{u}$.

Note. A vector can be broken into *components* of which it is a sum.

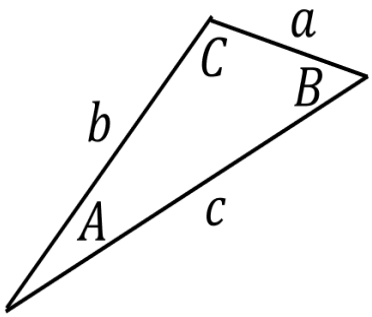
Note. You may need the following to work the homework problems:

1. Law of Sines. Every triangle satisfies the following:



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

2. Law of Cosines. Every triangle satisfies the following:



$$a^2 = b^2 + c^2 - 2bc\cos A$$

Example. Page 25 Number 2.9.