9.1: Introduction to Vectors

Some quantities we measure in physics have only a magnitude; such quantities are called scalars. Examples of scalars are mass and temperature. Other quantities have both a magnitude and a direction; such quantities are called vectors. Examples of vectors are velocity, acceleration, and electric field.

You can represent a vector graphically by drawing an arrow. The direction of the arrow indicates the direction of the vector, while the length of the arrow represents the magnitude of the vector on some chosen scale. By convention, we write vector names in boldface type in typeset text (e.g. A); when writing vectors by hand, it is customary to draw a small arrow over the name (e.g. $\vec{A}$).

Besides drawing a vector in the plane of the page, occasionally you may want to draw a vector diagram in which you want to indicate a vector pointing directly into or out of the page. You can do this using these symbols:

Symbol	Meaning
$\longrightarrow$	Vector *in plane* of page
$\otimes$	Vector *into* page
$\odot$	Vector *out of* page

The symbol $\otimes$ is supposed to look like the tail feathers of an arrow flying away from you, while the symbol $\odot$ is supposed to resemble the head of an arrow flying directly toward you. Of course, if you use these two symbols, you can only indicate the direction of the vector, not its magnitude—but this is often all that's needed.

It is possible to do arithmetic on vectors: for example, you can add or subtract two vectors, or multiply a vector by a scalar. These operations may be done either graphically or algebraically. Both methods will be described here.