VECTORS

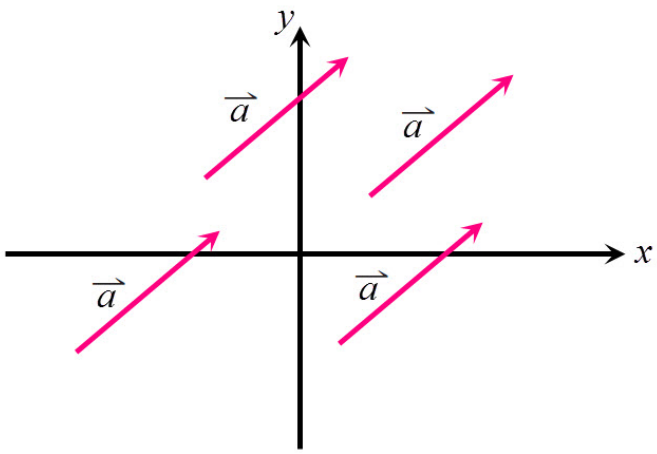
Vectors are used to represent quantities that have both a magnitude and a direction. Good examples of quantities that can be represented by vectors are force and velocity. Both of these have a direction and a magnitude.

2.1. Definitions

A vector is a directed line segment. The directed line segment $\overrightarrow{AB}$ has initial point A and terminal point B; its length is denoted by $|AB|$ or $\left|\overrightarrow{AB}\right|$. Two vectors are equal if they have the same length and direction.

Vectors are independent of the point of application. It means, they only impart magnitude and direction. They don't impart any information about where the quantity is applied. So, any directed line segment with the same length and direction will represent the same vector.

Each of the directed line segments in the sketch represents the same vector $\vec{a}$.



So, a two-dimensional vector is an ordered pair $v = \langle v_1, v_2 \rangle$ of real numbers, and a three-dimensional vector is an ordered triple $v = \langle v_1, v_2, v_3 \rangle$ of real numbers. The numbers and are called the components of v.

A representation of the vector $v = \langle v_1, v_2 \rangle$ in two-dimensional plane is any directed line segment, $\overrightarrow{AB}$, from the point A = (x, y) to the point B = ($x + v_1$, $y + v_2$). Likewise, a representation of the vector $v = \langle v_1, v_2, v_3 \rangle$ in three-dimensional space is any directed line segment, $\overrightarrow{AB}$, from the point A = (x, y, z) to the point B = ($x + v_1$, $y + v_2$, $z + v_3$).