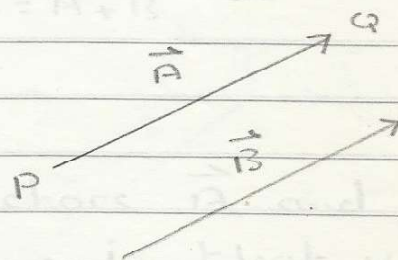


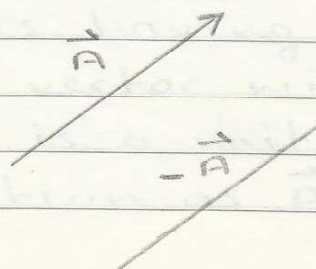
Chapter 1 : Vector Analysis

A "vector" is a directed line segment \vec{PQ} from one point P called the "initial point" to another point Q called the "terminal point". Vectors are denoted by bold faced letters or letters with an arrow over them. The "magnitude" or "length" of the vector is denoted by $|\vec{PQ}|$.

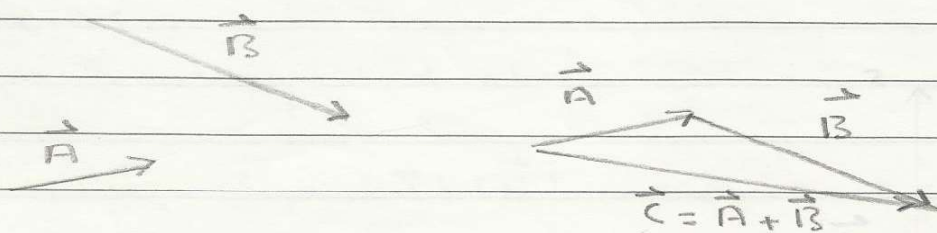


Vector Algebra :

1. Two vectors \vec{A} and \vec{B} are "equal" if they have the same magnitude and direction regardless of their initial points. Thus $\vec{A} = \vec{B}$ in the figure above.
2. A vector having direction opposite to that of vector \vec{A} but with the same magnitude is denoted by $-\vec{A}$.



3. The "sum" or "resultant" of vectors \vec{A} and \vec{B} is a vector \vec{C} formed by placing the initial point of \vec{B} on the terminal point of \vec{A} and joining the initial point of \vec{A} to the terminal point of \vec{B} .



4. The "difference" of vectors \vec{A} and \vec{B} , represented by $\vec{A} - \vec{B}$, is that vector \vec{C} which added to \vec{B} gives \vec{A} . Equivalently, $\vec{A} - \vec{B}$ may be defined as $\vec{A} + (-\vec{B})$.

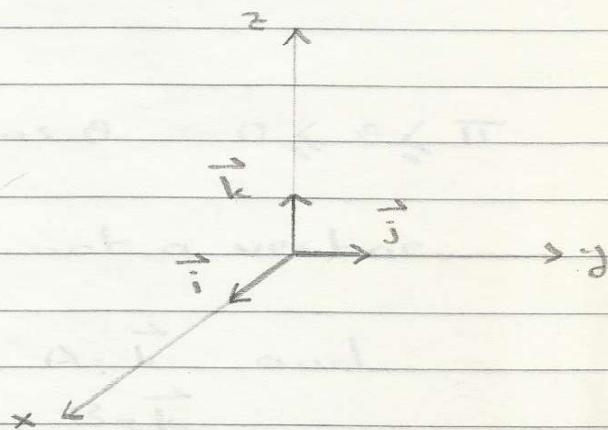
5. Multiplication of a vector \vec{A} by a scalar m produces a vector $m\vec{A}$ with magnitude $|m|$ times the magnitude of \vec{A} and direction the same as or opposite to that of \vec{A} according as m is positive or negative.

Unit Vectors :

"Unit Vectors" are vectors having unit length. If \vec{A} is any vector with length $|\vec{A}| > 0$, then $\vec{A}/|\vec{A}|$ is a unit vector having the same direction as \vec{A} .

Rectangular Unit Vectors:

The rectangular unit vectors \vec{i} , \vec{j} and \vec{k} are unit vectors having the direction of the positive x , y - and z -axes of a rectangular coordinate system. We use right-handed rectangular coordinate systems.



Components of a Vector:

Any vector can be represented with initial point at the origin O of a rectangular coordinate system. Let (A_1, A_2, A_3) be the coordinates of the terminal point of vector \vec{A} with initial point at O . The vectors $A_1\vec{i}$, $A_2\vec{j}$ and $A_3\vec{k}$ are called the "component vectors" of \vec{A} in the x -, y - and z -directions respectively. We write

$$\vec{A} = A_1\vec{i} + A_2\vec{j} + A_3\vec{k}$$

The magnitude of \vec{A} is $|\vec{A}| = \sqrt{A_1^2 + A_2^2 + A_3^2}$