2. Vectors

Magnitude of vector $\vec{AB} = |\vec{AB}| = AB =$ length of vector

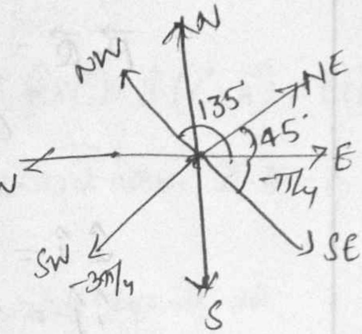
$|\hat{i}| = |\hat{j}| = |\hat{k}| = 1$

Position of vector $\vec{R} = x\hat{i} + y\hat{j} + z\hat{k}$

Magnitude of vector $\vec{R} = |\vec{R}| = R = \sqrt{x^2+y^2+z^2}$

$$\hat{A} = \frac{x\hat{i} + y\hat{j} + z\hat{k}}{\sqrt{x^2+y^2+z^2}}$$ | Magnitude of unit vector $(\vec{A})$

Components of vector:



$$\vec{R} = \vec{R_x} + \vec{R_y}$$

$$R = \sqrt{R_x^2 + R_y^2}$$

$$\cos\theta = \frac{R_x}{R}$$

$$\theta = \cos^{-1}\left(\frac{R_x}{R}\right)$$

Direction cosines:

$$\vec{A} = |\vec{A}| = A = \sqrt{A_x^2 + A_y^2 + A_z^2}$$

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$$

$$\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$$

Parallelogram law of addition of vectors

$$|\vec{P}+\vec{Q}| = R = \sqrt{P^2+Q^2+2PQ\cos\theta}$$

$$\alpha = \tan^{-1}\left[\frac{Q\sin\theta}{P+Q\cos\theta}\right]$$

$$\frac{R_{max}}{R_{min}} = \frac{P+Q}{P-Q}$$

Lami's Theorem

$$\frac{P}{\sin\alpha} = \frac{Q}{\sin\beta} = \frac{R}{\sin\gamma}$$

→ For any 2 vectors to be ⊥er to each other $\vec{A}\cdot\vec{B}=0$

→ $|\vec{A}\times\vec{B}|^2+|\vec{A}\cdot\vec{B}|^2=A^2B^2$

→ A vector will change if rotated because its direction changes.

→ A vector will not changed if it is slid parallel to itself.

→ Max. value of magnitude of $(\vec{A}-\vec{B})$ is $A+B$.

→ If 2 vectors are equal and their resultant is also equal to one of them, then $\theta=120^\circ$

→ If $\theta=90^\circ$ then $|\vec{A}+\vec{B}|=|\vec{A}-\vec{B}|=\sqrt{A^2+B^2}$

Consider 'n' identical forces are acting on a particle making some angle θ with each other then if 'n' is even resultant is zero, if 'n' is odd then resultant is F

If $\vec{P}+\vec{Q}\perp\vec{P}-\vec{Q}$ then $|\vec{P}|=|\vec{Q}|\Rightarrow P=Q$

$\vec{A}+\vec{B}=\vec{A}(\vec{R})$ then θ b/w them 120°