COMPONENTS OF A VECTOR.

A unit vector is a vector of magnitude 1.
A unit vector is denoted by $\hat{\underset{\sim}{a}}$.

$\hat{\underset{\sim}{a}}$ is the unit vector with the same direction as $\underset{\sim}{a}$

$$\hat{\underset{\sim}{a}} = \frac{\underset{\sim}{a}}{|\underset{\sim}{a}|}$$

* Cartesian Form

The unit vector in the +ve direction of the x-axis is $\underset{\sim}{i}$
The unit vector in the +ve direction of the y-axis is $\underset{\sim}{j}$
The unit vector in the +ve direction of the z-axis is $\underset{\sim}{k}$.

- Two Dimensions
  For the point $P(x, y)$.

$$\overrightarrow{OP} = x\underset{\sim}{i} + y\underset{\sim}{j}$$

$$|\overrightarrow{OP}| = r = \sqrt{x^2 + y^2}$$

Direction
$$\tan\theta = \frac{y}{x}$$
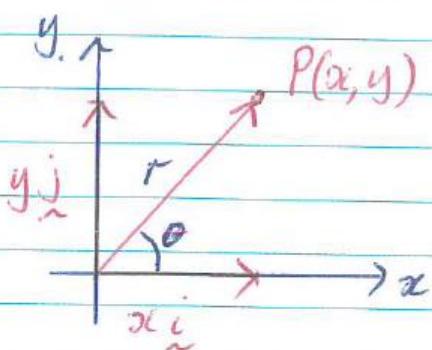
- Three Dimensions
  For the Point $P(x, y, z)$.

$$\overrightarrow{OP} = x\underset{\sim}{i} + y\underset{\sim}{j} + z\underset{\sim}{k}$$

$$|\overrightarrow{OP}| = r = \sqrt{x^2 + y^2 + k^2}$$

Direction made with an axis

x-axis $\quad \cos\alpha = \dfrac{x}{|\overrightarrow{OP}|}$

y-axis $\quad \cos\beta = \dfrac{y}{|\overrightarrow{OP}|}$

z-axis $\quad \cos\gamma = \dfrac{z}{|\overrightarrow{OP}|}$