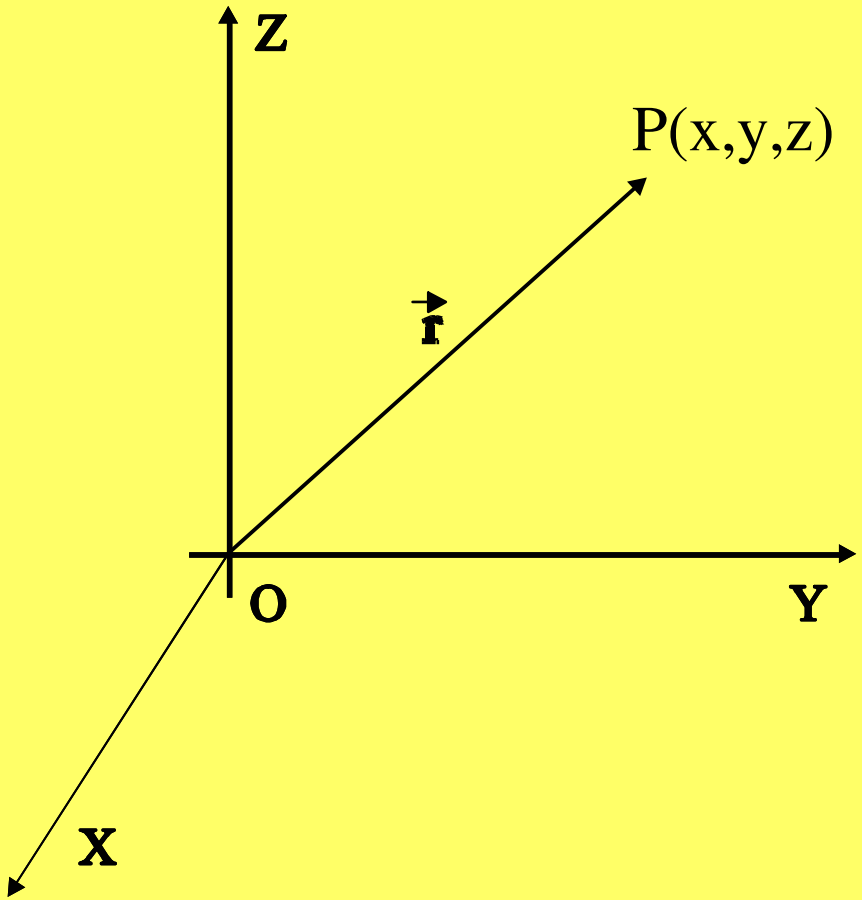
LECCION 5: CINEMATICA DEL PUNTO

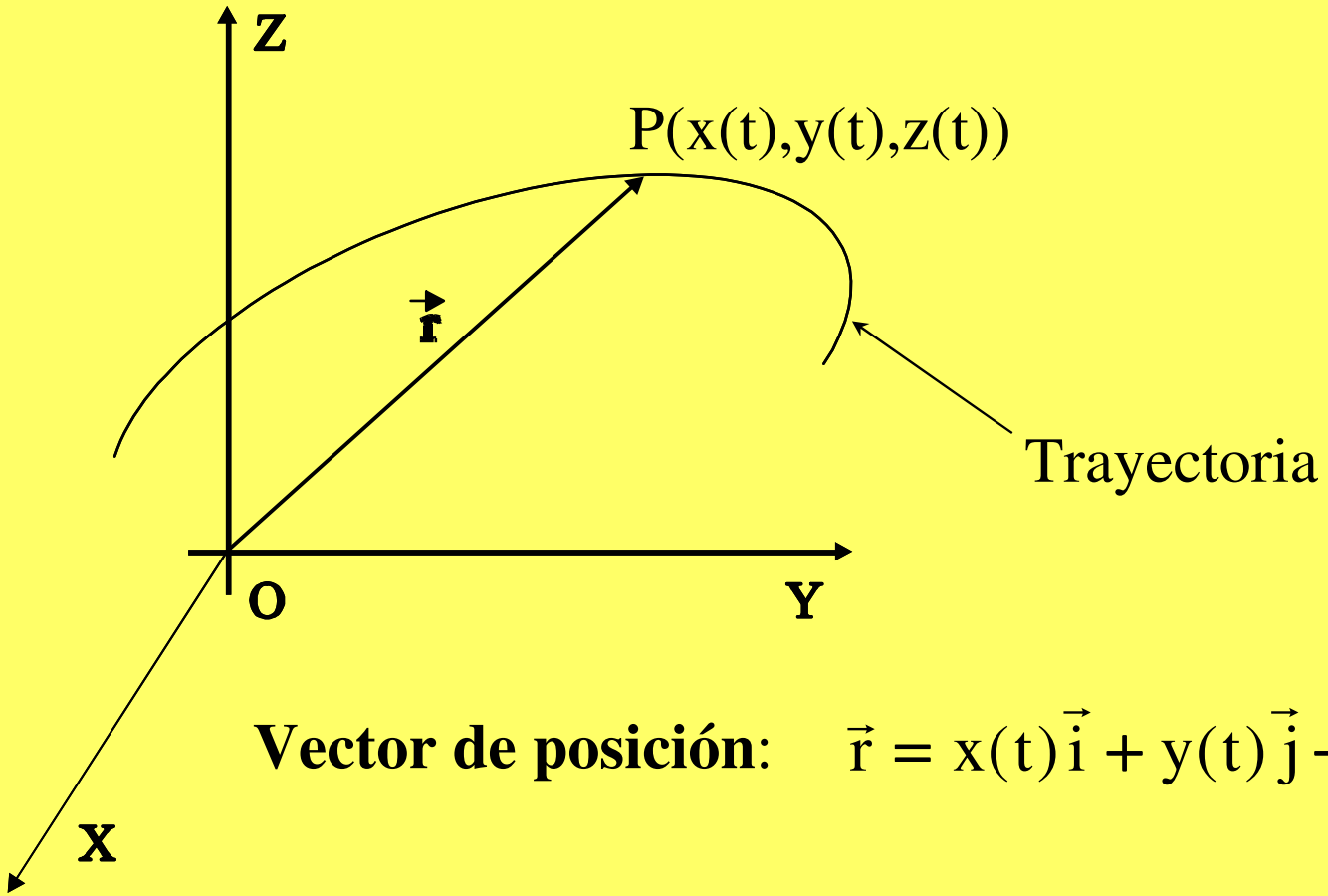
- 5.1.- Punto material.
- 5.2.- Vector de posición. Trayectoria.
- 5.3.- Vector velocidad.
- 5.4.- Vector aceleración.
- 5.5.- Algunos tipos de movimientos.

5.2.-VECTOR DE POSICION



$$\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$$

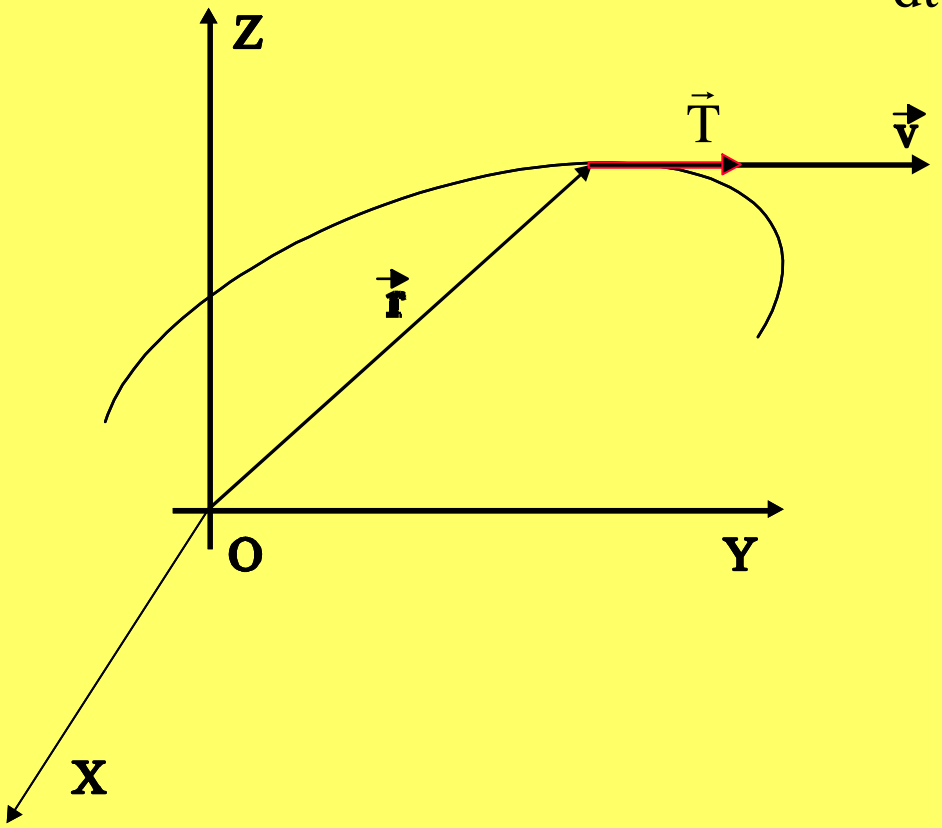
5.2.-VECTOR DE POSICION. TRAYECTORIA.



Vector de posición: $\vec{r} = x(t)\vec{i} + y(t)\vec{j} + z(t)\vec{k}$

5.3.-VECTOR VELOCIDAD

$$\vec{v}(t) = \frac{d\vec{r}(t)}{dt} = \frac{dx(t)}{dt}\vec{i} + \frac{dy(t)}{dt}\vec{j} + \frac{dz(t)}{dt}\vec{k}$$

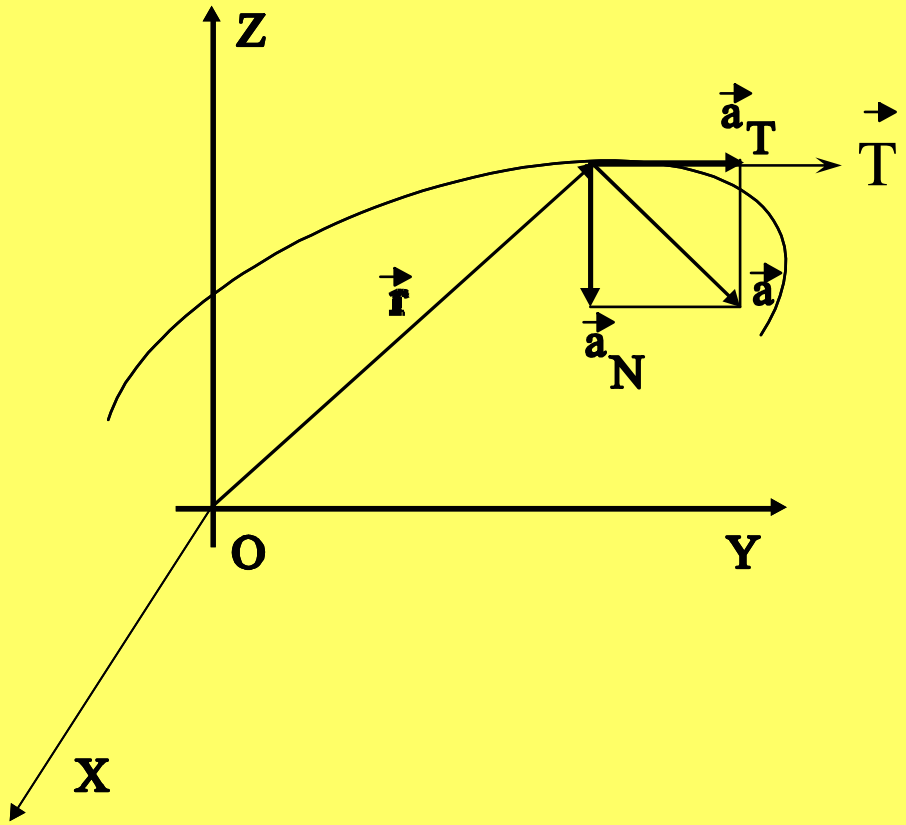


$$\vec{T} = \frac{\vec{v}}{|\vec{v}|}$$

$$v = |\vec{v}| = \left|\frac{d\vec{r}}{dt}\right|$$

$$\vec{v}(t) = v\vec{T}$$

5.4.-VECTOR ACELERACION



$$\vec{a}(t) = \frac{d\vec{v}(t)}{dt} = \frac{d^2\vec{r}(t)}{dt^2}$$

$$\vec{a}(t) = \frac{d\vec{v}}{dt} = \frac{d(v\vec{T})}{dt} = \frac{dv}{dt}\vec{T} + v\frac{d\vec{T}}{dt}$$

$$\frac{d\vec{T}}{dt} \perp \vec{T} \qquad \vec{N} = \frac{\frac{d\vec{T}}{dt}}{\left|\frac{d\vec{T}}{dt}\right|} \qquad \rho = \frac{v}{\left|\frac{d\vec{T}}{dt}\right|}$$

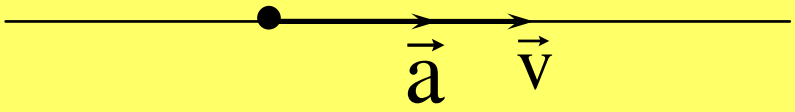
$$\vec{a} = \frac{dv}{dt}\vec{T} + \frac{v^2}{\rho}\vec{N} = \vec{a}_T + \vec{a}_N$$

$$\boxed{\vec{a} = \vec{a}_T + \vec{a}_N}$$

5.5.-ALGUNOS TIPOS DE MOVIMIENTOS

MOVIMIENTO RECTILINEO

$$\rho = \infty \Rightarrow \vec{a}_N = 0$$



MOVIMIENTO PLANO

$$\vec{B} = \vec{T} \wedge \vec{N} \quad \text{cte}$$

MOVIMIENTO UNIFORME

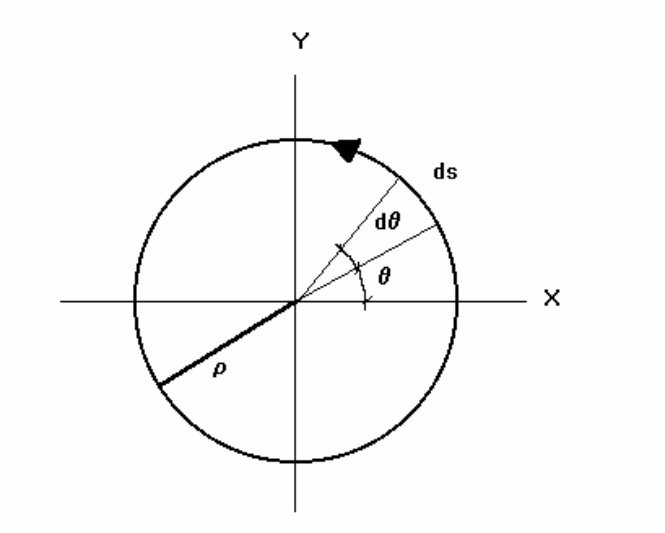
$$v = \text{cte} \Rightarrow a_T = 0$$

MOVTO. UNIFORMEMENTE VARIADO

$$a_T = \text{cte}$$

5.5.-ALGUNOS TIPOS DE MOVIMIENTOS

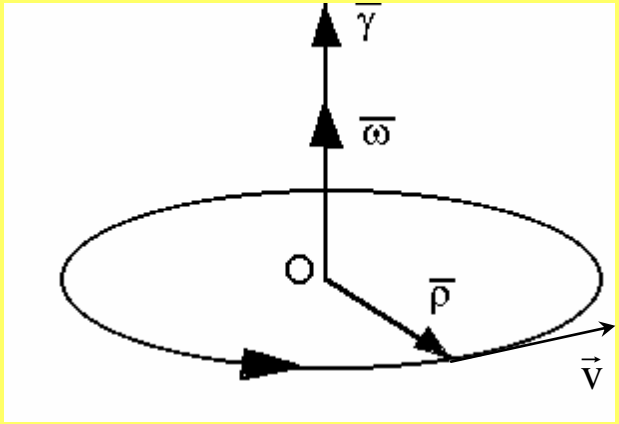
MOVIMIENTO CIRCULAR



$$\left.\begin{aligned} x &= \rho\cos\theta(t) \\ y &= \rho\,\mathrm{sen}\,\theta(t) \end{aligned}\right\}$$

$$\boxed{\omega = \frac{d\theta}{dt}}$$

$$v(t) = \frac{ds}{dt} = \frac{d(\rho d\theta)}{dt} = \rho\frac{d\theta}{dt} = \rho\omega(t)$$

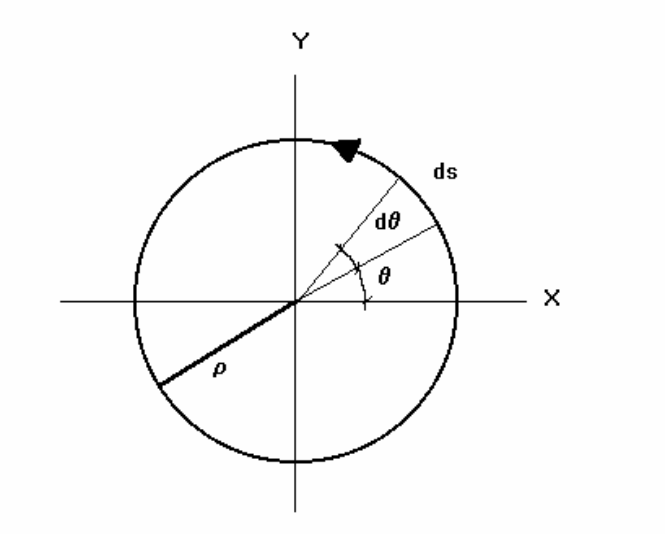


$$\vec{v} = \rho\omega\vec{T} = \vec{\omega}\wedge\vec{\rho}$$

$$\alpha(t) = \frac{d\omega(t)}{dt} = \frac{d^2\theta(t)}{dt^2}$$

5.5.-ALGUNOS TIPOS DE MOVIMIENTOS

MOVIMIENTO CIRCULAR UNIFORME



$$\omega = cte \Rightarrow \alpha = 0$$

$$a_T = 0 \qquad a_N = \frac{v^2}{\rho} = \omega^2 \rho$$

$$T = \frac{2\pi}{\omega} \qquad f = \nu = \frac{\omega}{2\pi} = \frac{1}{T}$$

MOVIMIENTO CIRCULAR UNIFORMEMENTE VARIADO

$$\alpha = cte$$