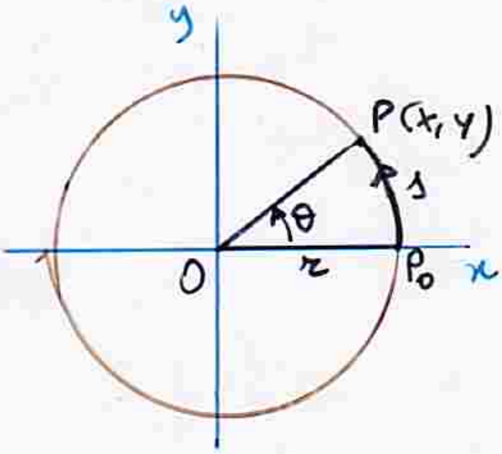
CINEMATICA ROTAZIONALE

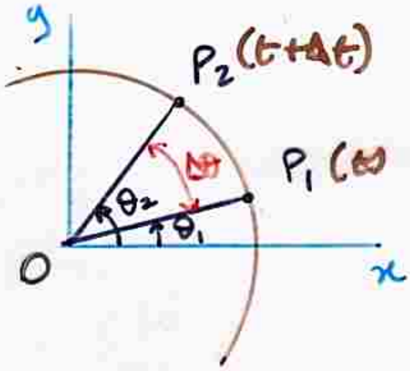
IN UN PIANO



- Posizione angolare

$$\theta = \frac{s}{r} \quad \text{(radianti)}$$

$$\theta = \theta(t) \qquad s = s(t)$$



- Velocità angolare

$$\theta_1 = \theta(t_1) \; ; \; \theta_2 = \theta(t_2)$$

$$\omega_m = \frac{\theta_2 - \theta_1}{t_2 - t_1} = \frac{\Delta\theta}{\Delta t}$$

$$\omega = \lim_{\Delta t \to 0} \frac{\Delta\theta}{\Delta t} = \frac{d\theta}{dt}$$

$$\omega = \omega(t) \qquad \text{(rad/sec)}$$

- Accelerazione angolare

$$\omega_1 = \omega(t_1) \; , \; \omega_2 = \omega(t_2)$$

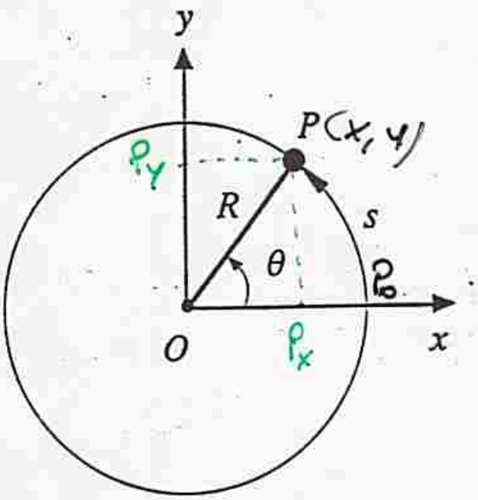
$$\alpha_m = \frac{\omega_2 - \omega_1}{t_2 - t_1} = \frac{\Delta\omega}{\Delta t}$$

$$\alpha = \lim_{\Delta t \to 0} \frac{\Delta\omega}{\Delta t} = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$$

$$\text{(rad/sec}^2\text{)}$$

MOTO CIRCOLARE UNIFORME

Traiettoria : circonferenza



Velocità : $v = |\vec{v}| = \text{costante}$

Descrizione :

arco $s(t)$
angolo $\theta(t)$

$$\theta(t) = \frac{s(t)}{R} \qquad \text{(radianti)}$$

$$v = \frac{ds}{dt} = \text{cost} \Rightarrow \qquad s(t) = s_0 + vt \qquad \text{eq. oraria}$$

Definizione : Velocità angolare ω

$$\omega = \frac{d\theta}{dt} = \frac{d}{dt}\left(\frac{s}{R}\right) = \frac{1}{R}\frac{ds}{dt} = \frac{v}{R} = \text{cost}$$

$$\omega = \frac{d\theta}{dt} = \text{cost} \Rightarrow \qquad \theta(t) = \theta_0 + \omega t \qquad \text{eq. oraria}$$

• Introducendo sist. rif. cartesiano ortogonale Oxy

$$x(t) = R\cos[\theta(t)] \qquad y(t) = R\sin[\theta(t)]$$

$$x^2 + y^2 = R^2(\cos^2\theta + \sin^2\theta) = R^2$$

- $\omega = \text{cost}$ moto circolare uniforme

$$\theta = \theta_0 + \omega t$$

- $\alpha = \text{cost}$ moto circolare unif. accelerato

$$\theta(t) = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$$
$$\omega(t) = \omega_0 + \alpha t$$

- Cinem. lineare $\Leftrightarrow$ Cinem. rotazionale

$$s = \theta R$$

$$v = \frac{ds}{dt} = R\frac{d\theta}{dt} = R\omega \Rightarrow \boxed{v = \omega R}$$

$$a_T = \frac{dv}{dt} = R\frac{d\omega}{dt} = R\alpha \Rightarrow \boxed{a_T = \alpha R}$$

$$a_R = \frac{v^2}{R} \Rightarrow \boxed{a_R = \omega^2 R}$$

- Descrizione angolare :

problema bidimensionale →

→ problema unidimensionale