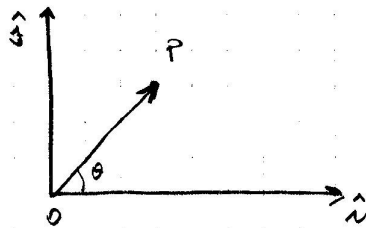


Esercizio del moto in coord. polari

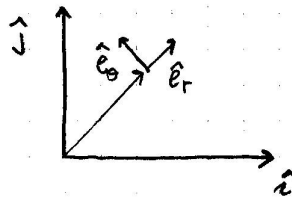
Posizione di P (x, y)



$$\vec{OP} = x \hat{i} + y \hat{j} = \vec{r} \quad (1)$$

Dato r e θ $\begin{cases} x = r \cos \theta \\ y = r \sin \theta \end{cases} \quad (2)$

Introduco $\hat{e}_r$ e $\hat{e}_\theta$



$$\vec{r} = r \hat{e}_r \quad (3)$$

■ Dato (1) e (3), verifichiamo (2):

$$\begin{cases} \hat{e}_r = \cos \theta \hat{i} + \sin \theta \hat{j} \\ \hat{e}_\theta = -\sin \theta \hat{i} + \cos \theta \hat{j} \end{cases} \quad [\text{Verifica che sono } \perp]$$

$$\Rightarrow \vec{r} = \underbrace{r \cos \theta}_x \hat{i} + \underbrace{r \sin \theta}_y \hat{j}$$

Velocità: $\dot{\vec{r}} \equiv \vec{v} = \dot{x} \hat{i} + \dot{y} \hat{j} \quad \hat{i} \text{ e } \hat{j} \text{ fissi}$

$$\begin{aligned} \dot{\vec{r}} = \vec{v} &= (\dot{r} \cos \theta - r \dot{\theta} \sin \theta) \hat{i} \\ &+ (\dot{r} \sin \theta + r \dot{\theta} \cos \theta) \hat{j} \\ &= \dot{r} (\underbrace{\cos \theta \hat{i} + \sin \theta \hat{j}}_{\hat{e}_r}) + r \dot{\theta} (\underbrace{-\sin \theta \hat{i} + \cos \theta \hat{j}}_{\hat{e}_\theta}) \end{aligned}$$

$$\vec{v} = \dot{r} \hat{e}_r + r \dot{\theta} \hat{e}_\theta \quad (4)$$