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- GRANDEZZE MISURABILI

	10^{-6}	10^{-3}	10^{3}	10^{6}	10^{9}
• massa	μg	mg	kg	Mg	Gg
• tempo	μs	ms	s	—	—
• spazio	μm	mm	km	—	—

PICO NANO MICRO MILLI - KILO MEGA GIGA TERA

- CALCOLO DIMENSIONALE

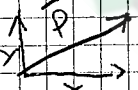
Le formule devono essere dimensionalmente corrette

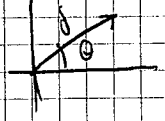
$$[v] = \frac{[l]}{[t]} \qquad [a] = [l][t]^{-2}$$

VETTORI

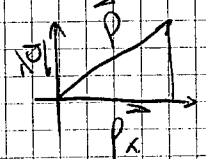
Rappresentazioni

1) $\vec{P} = (x, y)$

2) 

3) 

$\vec{P} = (\rho, \theta)$

4) 

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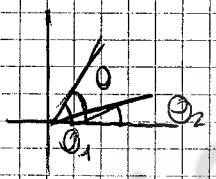
OPERAZIONI

1) Prodotto x scalare $\rightarrow \vec{P}_1(x,y) \cdot \vec{P}_2(x_1,y_1) = xx_1 + yy_1$

2) Prodotto scalare $\rightarrow \lambda P_1(x,y) = P_1 = (\lambda x, \lambda y)$

$\vec{P}_1(\rho_1, \theta_1)$ $\vec{P}_2(\rho_2, \theta_2)$ $\vec{P}_1 \cdot \vec{P}_2 = |\vec{P}_1||\vec{P}_2| \cos\theta$

$\theta = \theta_2 - \theta_1$



Versori: $\vec{i}(1,0,0)$, $\vec{j}(0,1,0)$, $\vec{k}(0,0,1)$

$x \in \mathbb{R}^3 \mid x = \alpha\vec{i} + \beta\vec{j} + \gamma\vec{k}$

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

ES

θ tra $\vec{v}$ e $\vec{j}(1,3,5)$

$\theta = \arccos \dfrac{\vec{v} \cdot \vec{i}}{|\vec{v}||\vec{i}|} = \arccos \dfrac{v_y}{|\vec{v}|}$

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$\vec{F} \iff \vec{a} \iff \vec{p}(t)$

ES

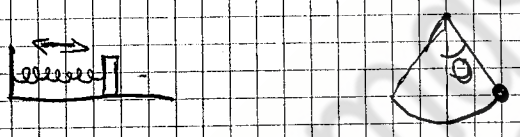
$\vec{p} = A\cos\omega t \quad t=0 \quad p=A$

$\vec{v} = -\omega A \operatorname{sen}\omega t \quad t=0 \quad v=0$

$\vec{a} = -\omega^2 A \cos\omega t \quad t=0 \quad a = -\omega^2 A$

In tutti i casi in cui $-k\cdot\vec{x}(t) = \vec{a}(t)$ "Moto Armonico"

l'accelerazione è proporzionale secondo $-k$ alla posizione



$\vec{\theta}_{\omega} = k\theta$

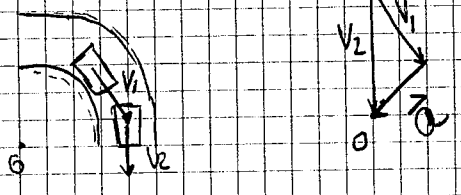
ES

$x(t) = A(1 - e^{-\beta t}) \qquad x(0) = 0$

$x'(t) = A\beta e^{-\beta t} \qquad x'(0) = A\beta$

$x''(t) = -A\beta^2 e^{-\beta t} \qquad x''(0) = -A\beta^2$

$\vec{a} = -\beta\vec{v}$ **Moto con attrito**



L'attrito è la forza centripeta che tiene l'auto in pista

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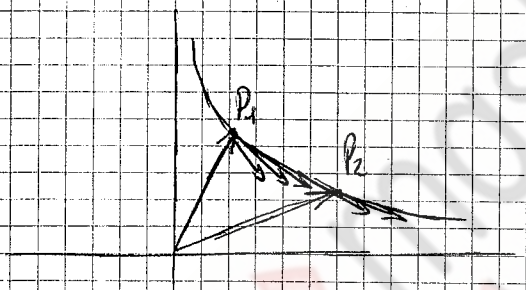
MOTI DI UN PUNTO MATERIALE

1) Traiettoria: luogo dei punti nello spazio del moto di un oggetto

2) Eq. orarie: relazione tra spazio e tempo

2 $\boxed{\vec{P}(t)=0}$ 1 $\boxed{f(x,y,z)=0}$

$$\vec{v} = \frac{d(\vec{P}(t))}{dt} \qquad \vec{v} = \left(\frac{dx}{dt}, \frac{dy}{dt}, \frac{dz}{dt}\right)$$



$$\lim_{\Delta t \to 0} \frac{P_2 - P_1}{\Delta t} \quad \text{per } P_2 \to P_1$$

$\boxed{\text{VELOCITÀ È SEMPRE TANGENTE ALLA TRAIETTORIA}}$

TRAIETTORIA RETTILINEA ⟶ VELOCITÀ COSTANTE

" CURVILINEA ⟶ " dir COSTANTE

$$\vec{a} = \frac{d\vec{v}(t)}{dt} = \left(\frac{dv_x(t)}{dt}, \frac{dv_y(t)}{dt}, \frac{dv_z(t)}{dt}\right)$$

$$\vec{a} = \frac{d^2\vec{P}(t)}{d^2t}$$

MOTO UNIFORME ACCELERATO

$\vec{a} = \text{cost}$, dunque $\vec{v} = \vec{v}_0 + \vec{a} \cdot t$, $\vec{x} = x_0 + \vec{v}_0 t + \frac{1}{2}\vec{a} t^2$

ES

$$\begin{cases} x(t) = 2t^2 - 3t^3 \\ y(t) = 5t + 4 \end{cases}$$

TROVARE L'ANGOLO FRA $\vec{a}$ e $\vec{v}$ a $t = 1s$

$$\vec{v} = \begin{cases} v_x(t) = 4t - 9t^2 \\ v_y(t) = 5 \end{cases} \qquad \vec{v}(1s) = (-5, 5)$$

$$\vec{a} = \begin{cases} a_x(t) = 4 - 18t \\ a_y(t) = 0 \end{cases} \qquad \vec{a}(1s) = (-14, 0)$$

$$\theta = \arccos \frac{\vec{a} \cdot \vec{v}}{|\vec{a}||\vec{v}|}$$

MOTI CIRCOLARI

$$\vec{x}(t) \begin{cases} x(t) = A\cos\omega t \\ y(t) = A\,\text{sen}\,\omega t \end{cases} \qquad \vec{v}(t) \begin{cases} v_x(t) = -\omega A\,\text{sen}\,\omega t \\ v_y(t) = \omega A\cos\omega t \end{cases}$$

$$\vec{a}(t) \begin{cases} a_x(t) = -\omega^2 A\cos\omega t \\ a_y(t) = -\omega^2 A\,\text{sen}\,\omega t \end{cases}$$