Lezione #2

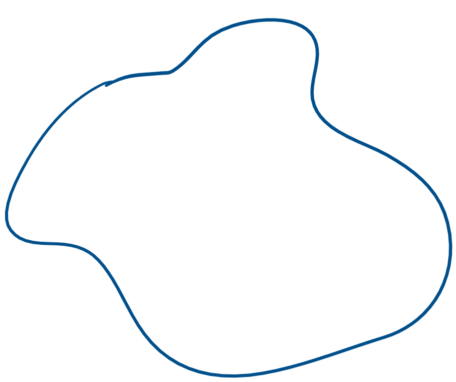
8/3/2023

Soluzione pto 2) dell'esercizio precedente:

$$h = \frac{v^2}{2g} \qquad \text{Dati} \begin{cases} g = 9{,}81\ m/s^2 \\ v = 5{,}13040\ m/s \end{cases}$$

$$\boxed{h = 1{,}3415 \simeq 1{,}34\ m} \qquad \checkmark \quad \frac{(5{,}13040)^2}{2 \cdot 9{,}81} =$$

Ipotesi di pto materiale



1) nessuna estensione spaziale

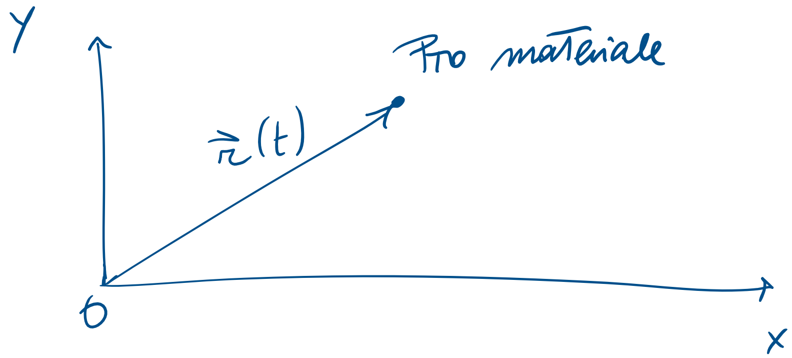
Sup = Volume = 0

2) massa $\neq 0$; masse tutte concentrate in un pto.

3) $\vec{v} << \vec{c}$ (v. luce)

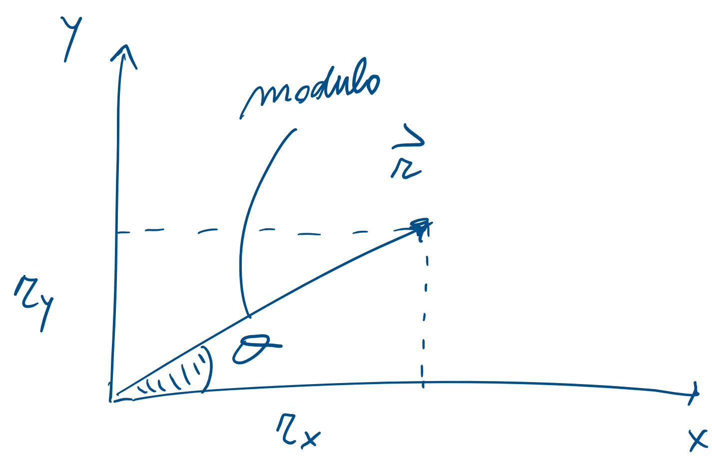
4) $d >> d_{ATOMICHE}$

- SPOSTAMENTO -



$\vec{r}(t)$: vettore posizione al tempo t

$$\vec{r}(t) = (r_x \, ; \, r_y)$$



A partire dal modulo $|\vec{r}| = r$

$$\begin{cases} r_x = r\cos\theta \\ r_y = r\sin\theta \end{cases}$$

$$r_y = r \sin\theta$$

Se invece conosco $(r_x ; r_y)$ e voglio calcolare il modulo:

$$\boxed{r = \sqrt{r_x^2 + r_y^2}}$$

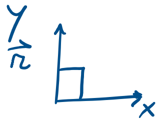
$$\frac{r_y}{r_x} = \frac{\cancel{r}\sin\theta}{\cancel{r}\cos\theta} = tg\,\theta$$

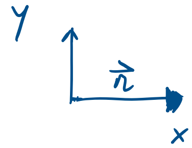
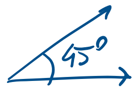
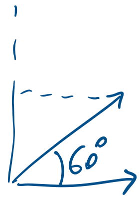
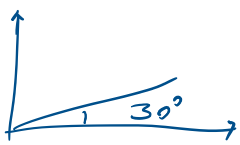
$$arctg\left(\frac{r_y}{r_x}\right) = \theta$$

Se voglio conoscere θ a partire dalle componenti:

$$\boxed{\theta = arctg\left(\frac{r_y}{r_x}\right)}$$

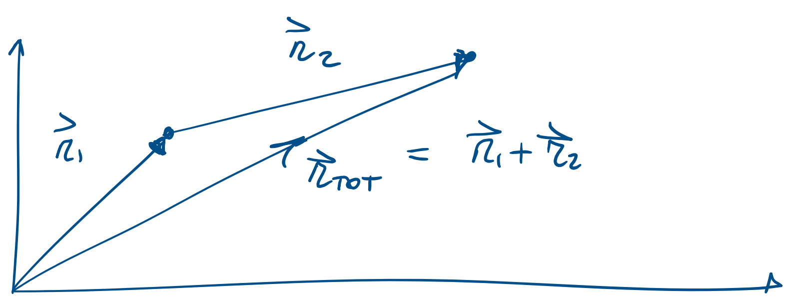
Angoli "notevoli":

	θ	$\sin\theta$	$\cos\theta$
	90°	1	0

	0	0	1
	$45°$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
	$60°$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
	$30°$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$

SOMMA/DIFFERENZA TRA VETTORI

$$\vec{r}_{TOT} = \vec{r}_1 \pm \vec{r}_2$$



$$\vec{r}_{TOT} = (r_{TOT,x} ; r_{TOT,y}) \qquad \begin{cases} r_{TOT,x} = r_{1x} + r_{2x} \\ r_{TOT,y} = r_{1y} + r_{2y} \end{cases}$$

$$r_{TOT} = \sqrt{r_{TOT,x}^2 + r_{TOT,y}^2}$$

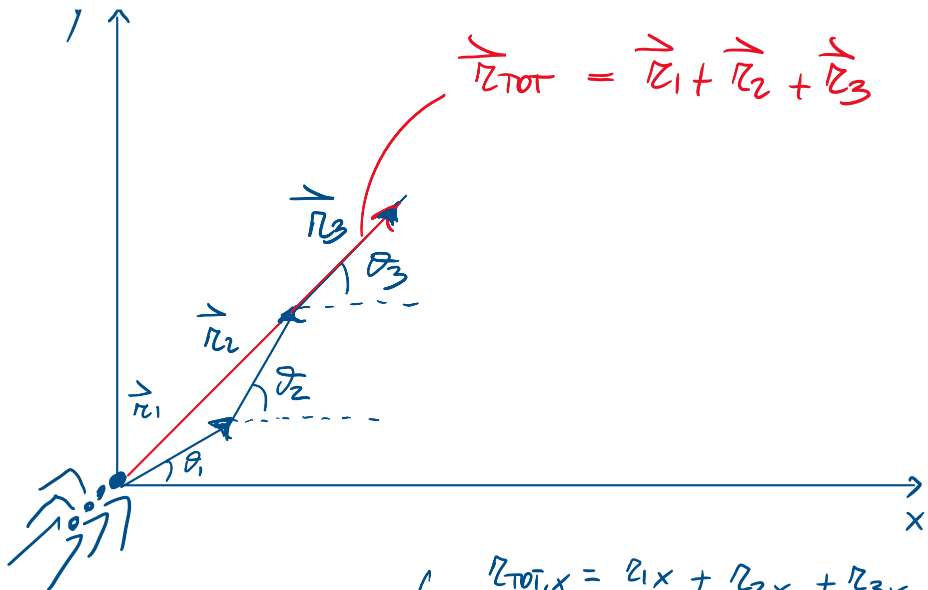
Esercizio:

FORMICA DEL DESERTO

Una formica del deserto esce alle ore 12:00 in cerca di cibo. Sapendo che compie 3 passi, ognuno di una lunghezza $|\vec{r}| = 2mm$ e gli angoli che formano i tre passi sono: $\theta_1 = 30°$; $\theta_2 = 60°$; $\theta_3 = 45°$, calcolare il suo spostamento complessivo.

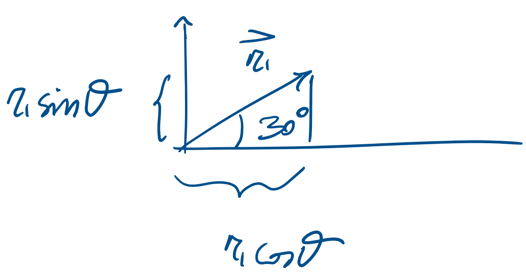
$$\vec{r}_{TOT} = \vec{r}_1 + \vec{r}_2 + \vec{r}_3$$

$$\vec{r}_{TOT} = \vec{r}_1 + \vec{r}_2 + \vec{r}_3$$



$$\vec{r}_{TOT} = (r_{TOT,x} \,;\, r_{TOT,y}) \qquad \begin{cases} r_{TOT,x} = r_{1x} + r_{2x} + r_{3x} \\ r_{TOT,y} = r_{1y} + r_{2y} + r_{3y} \end{cases}$$

$\vec{r}_1$



$$r_{1x} = r_1 \cos\theta = r_1 \cos(30°) = \dots$$

$$r_{1y} = r_1 \sin\theta = r_1 \sin(30°) = \dots$$

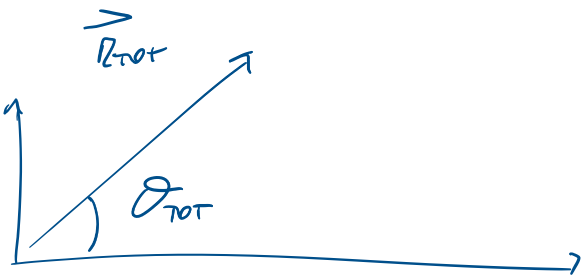
$$\begin{cases} r_{TOT,x} = r_1 \cos\theta_1 + r_2 \cos\theta_2 + r_3 \cos\theta_3 \\ r_{TOT,y} = r_1 \sin\theta_1 + r_2 \sin\theta_2 + r_3 \sin\theta_3 \end{cases} \qquad r_1 = r_2 = r_3 = r = 2\,10^{-3}\,m$$

$$\begin{cases} r_{TOT,x} = r\left(\cos\theta_1 + \cos\theta_2 + \cos\theta_3\right) = \cancel{r}\left(\frac{\sqrt{3}}{\cancel{2}} + \frac{1}{\cancel{2}} + \frac{\sqrt{2}}{\cancel{2}}\right) \\ r_{TOT,y} = r\left(\sin\theta_1 + \sin\theta_2 + \sin\theta_3\right) = \cancel{r}\left(\frac{1}{\cancel{2}} + \frac{\sqrt{3}}{\cancel{2}} + \frac{\sqrt{2}}{\cancel{2}}\right) \end{cases}$$

$$\begin{cases} r_{TOT,x} = 4{,}14\ 10^{-3}\,m \\ r_{TOT,y} = 4{,}14\ 10^{-3}\,m \end{cases}$$

$$r_{TOT} = \sqrt{r_{TOT,x}^2 + r_{TOT,y}^2} = 5{,}8548\ 10^{-3}\,m$$

$$\boxed{r_{TOT} \simeq 6\ 10^{-3}\,m\ (1\,c.s.)}$$



$$\theta_{TOT} = \mathrm{arctg}\left(\frac{4{,}14}{4{,}14}\right) = \mathrm{arctg}\,(1)$$

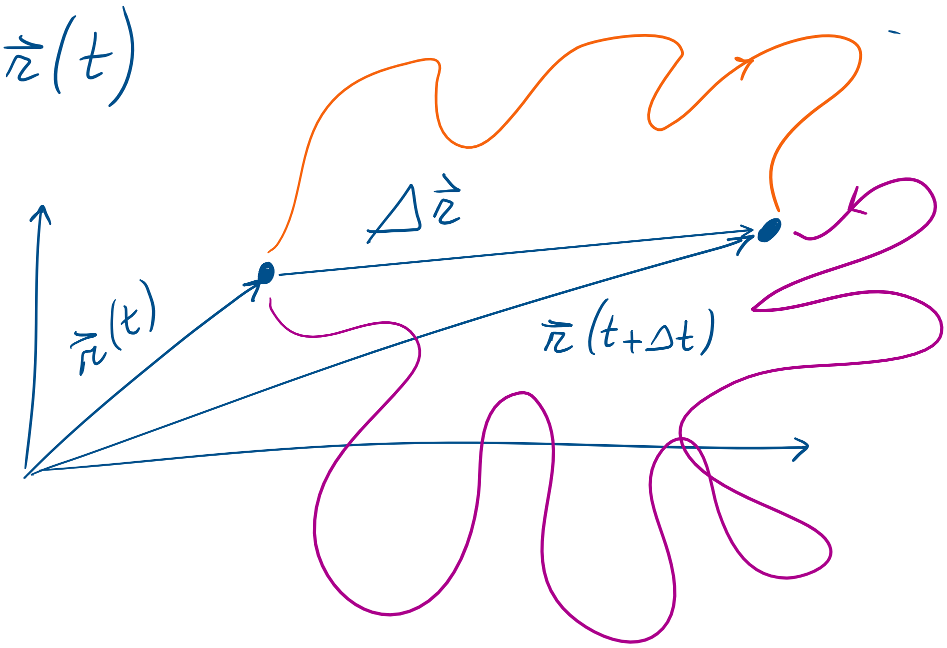
$$\boxed{\theta_{TOT} = 45^\circ}$$

Come definisco lo spostamento?

$\to$ posizione al tempo t

$$\Delta\vec{r} = \underbrace{\vec{r}(t+\Delta t)} - \vec{r}(t)$$

posizione dopo un intervallo Δt



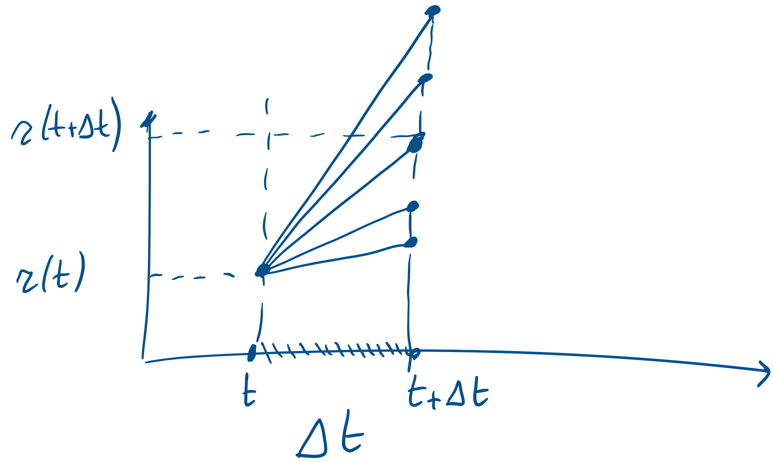
$$\vec{v} = \frac{\Delta\vec{r}}{\Delta t}$$

velocità è il rapporto tra lo spostamento e l'intervallo di tempo in cui esso

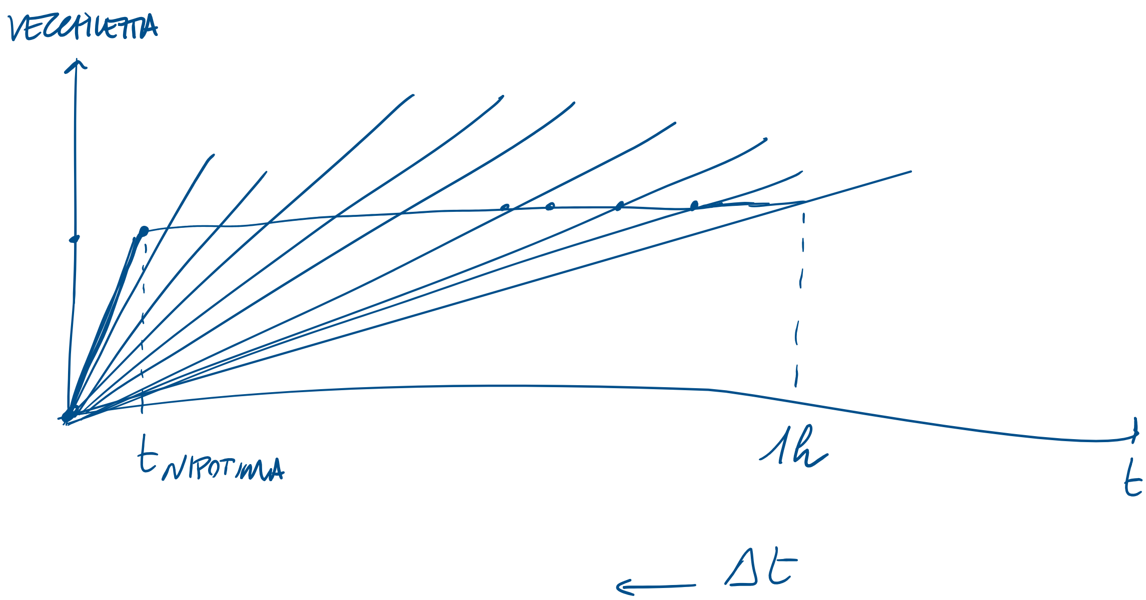
$$[\vec{v}] = \frac{m}{s}$$

La $\vec{v}$ è una grandezza vettoriale $\begin{cases} \text{modulo} \\ \text{direzione} \\ \text{verso} \end{cases}$

$$\vec{v}_m = \frac{\Delta \vec{r}}{\Delta t}$$



Se $\Delta t \to 0$ $$\vec{v}_m = \vec{v}_I = \frac{d\vec{r}}{dt}$$



$$v_I = v$$

v_m = v. media

v_I = " istantanea

Accelerazione:

$$\vec{a}_m = \frac{\Delta \vec{v}}{\Delta t}$$

quanto rapidamente cambia la $\vec{v}$ in un intervallo di tempo Δt

$$\vec{a} = \frac{d\vec{v}}{dt}$$

$$[a] = \frac{m}{s}\,\frac{1}{s} = m/s^2$$