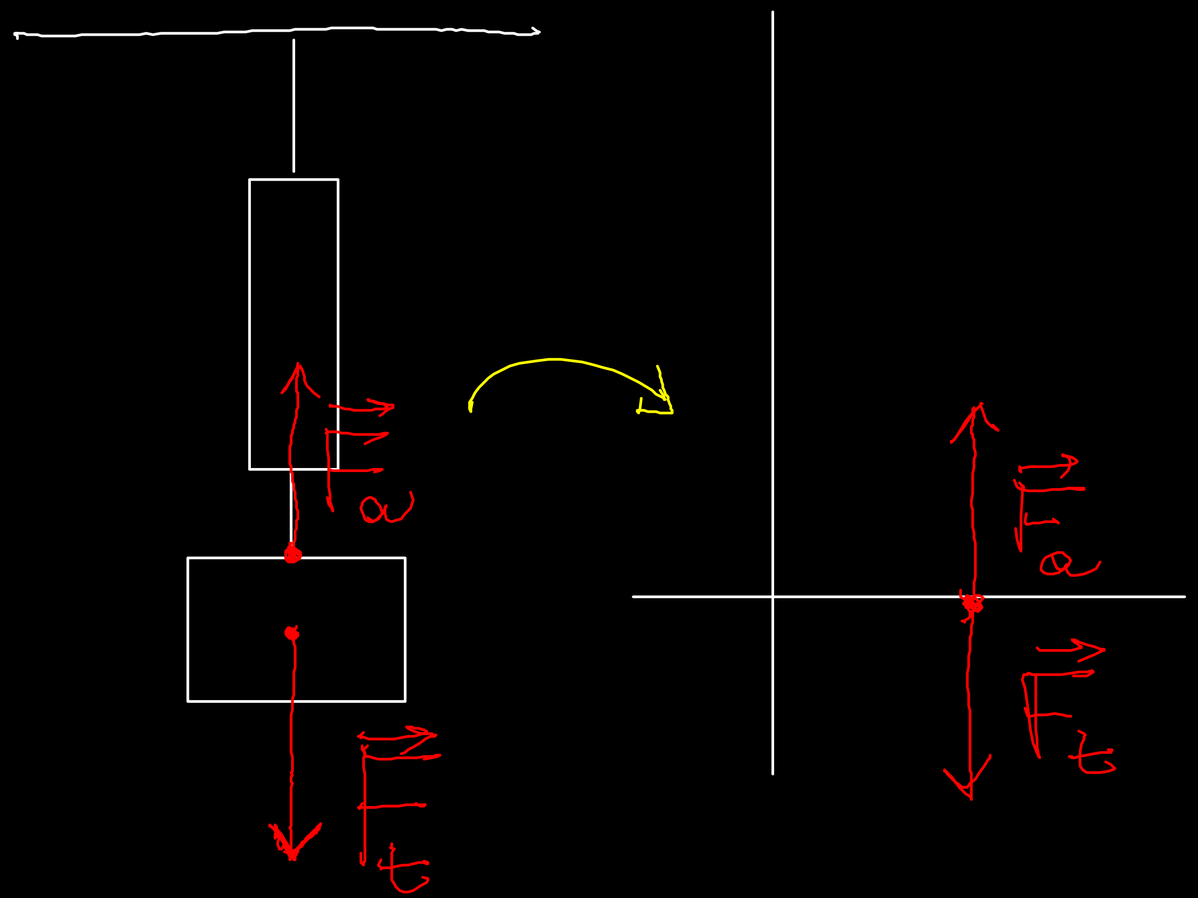
Def. Forza risultante

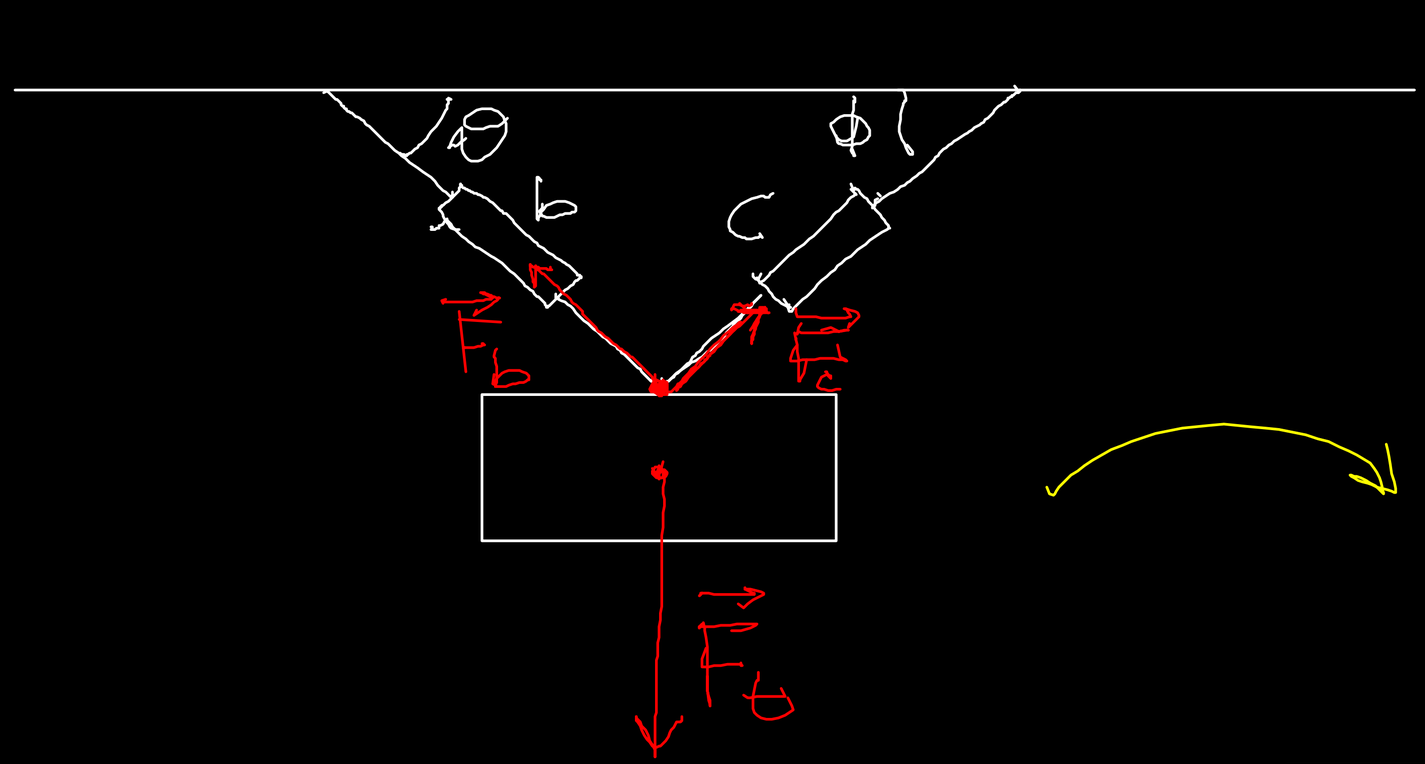
$$\sum \vec{F} = \vec{F}_1 + \vec{F}_2 + \dots$$

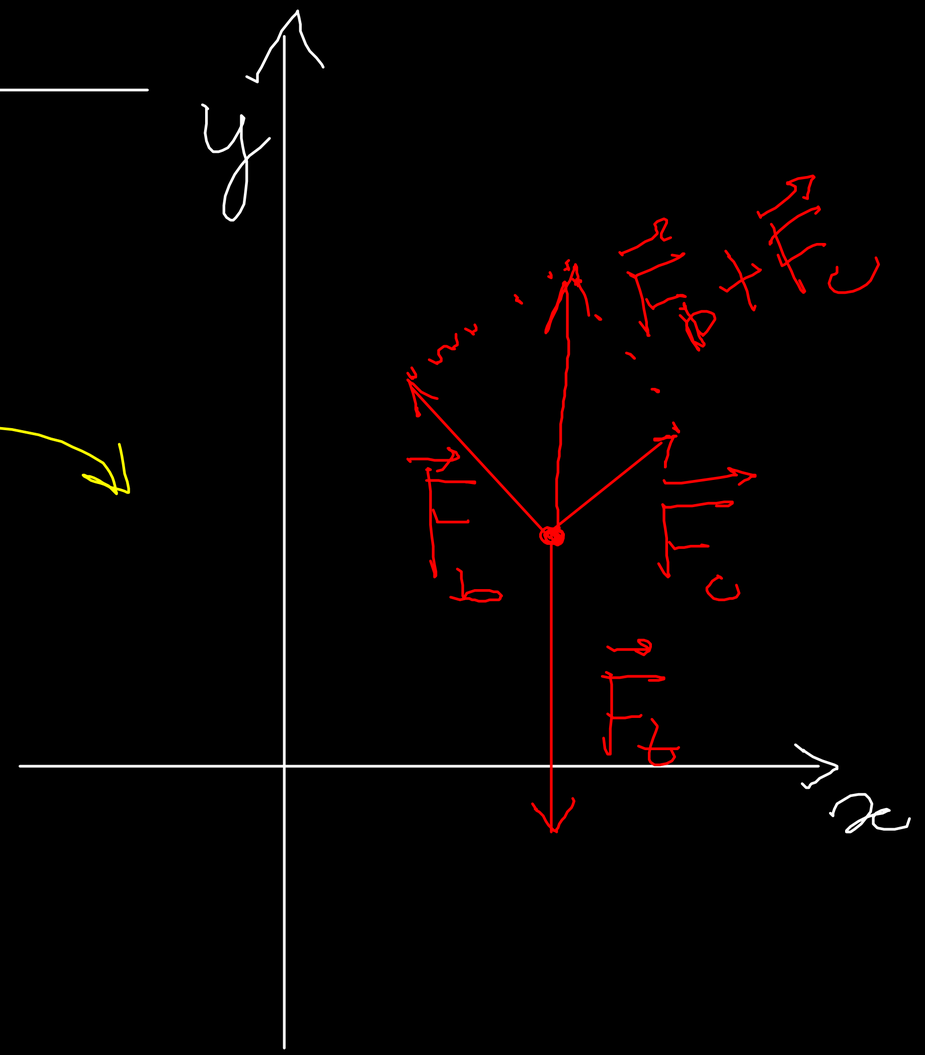
1° princ. Se $\sum \vec{F} = 0 \Rightarrow \vec{a} = 0$

agente su un corpo è nulla, accelerazione del corpo è nulla

Diagramma corpo libero


$\vec{F}_a$
$\vec{F}_t$
$\vec{F}_a$
$\vec{F}_t$


θ
ϕ
b
c
$\vec{F}_b$
$\vec{F}_c$
$\vec{F}_t$


y
x
$\vec{F}_b$
$\vec{F}_c$
$\vec{F}_b+\vec{F}_c$
$\vec{F}_t$

Dal 1° principio e

dal trovare sperimentalmente

almeno un sistema in cui esso vale

→ definisco sistemi

riferimento inerziale

∞

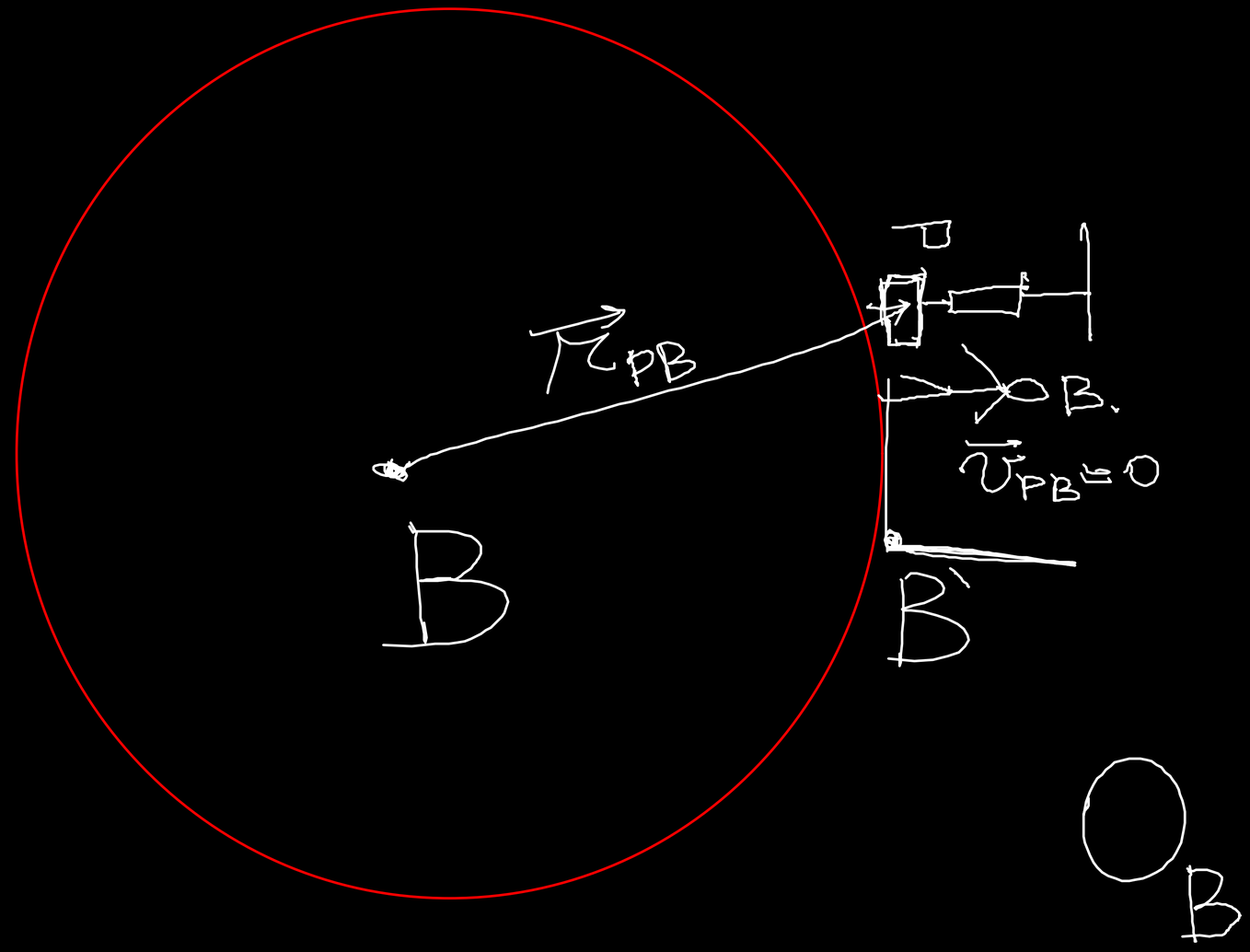
Riferimento terrestre.

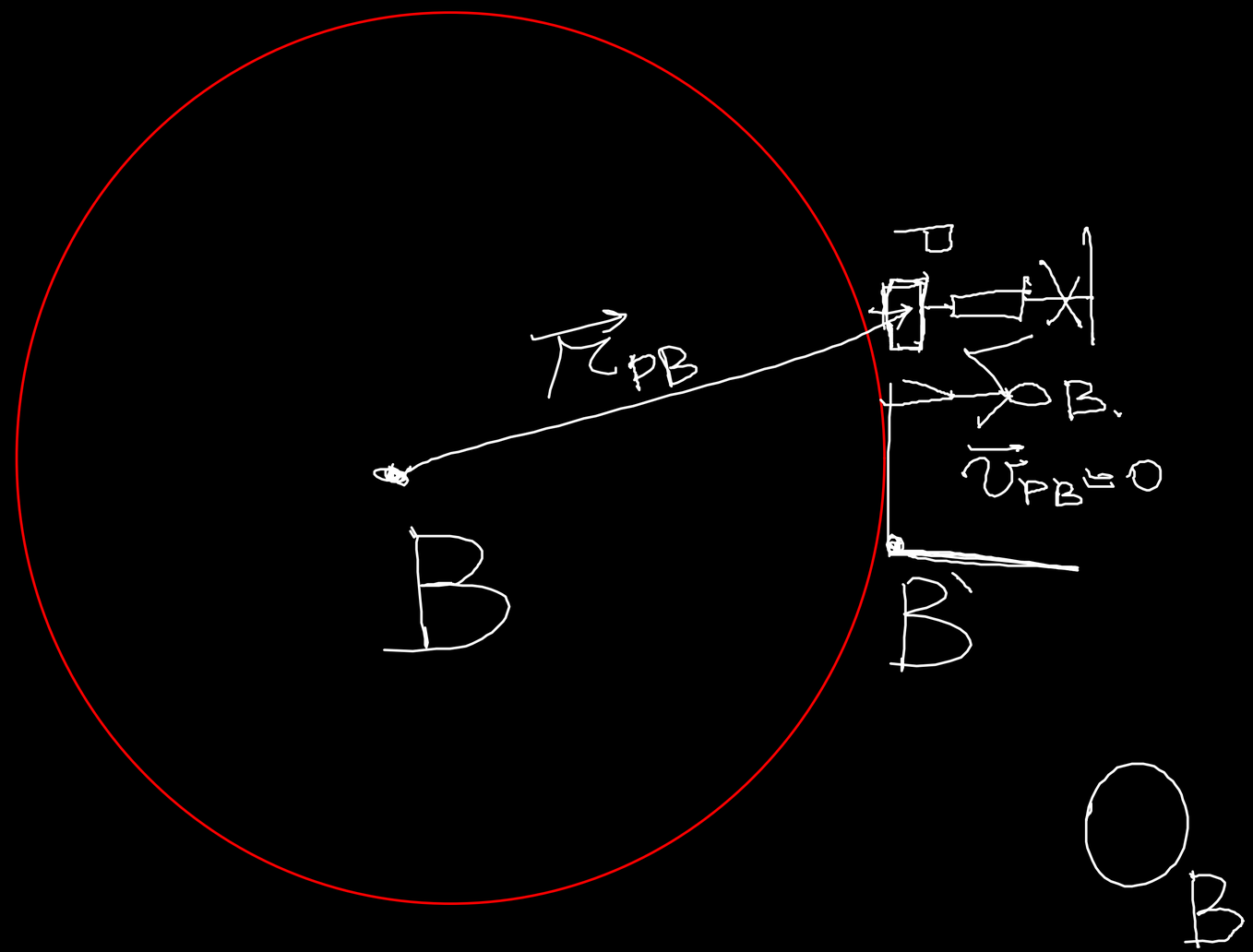
In prima approx sist. inerz.

$g = 9.8\ m/s^2$ $\quad 9.76\ m/s^2$ $\quad 9.83\ m/s^2$

$$\vec{a}_c = \vec{\omega} \times (\vec{\omega} \times \vec{r}_{PB})$$

$$a_c \simeq 0.034\ m/s^2$$


$\vec{r}_{PB}$
B
B.
$\vec{v}_{PB}=0$
B'
O
B


$\vec{r}_{PB}$
B
$\vec{v}$
B.
$\vec{v}_{PB}=0$
B'
O
B

5.4 Seconda legge di Newton

In un sistema inerziale l'accelerazione di un corpo è prop. alla forza risultante esercitata sul corpo stesso

$$\sum \vec{F} = m\vec{a}$$

m → massa inerziale

Problema diretto

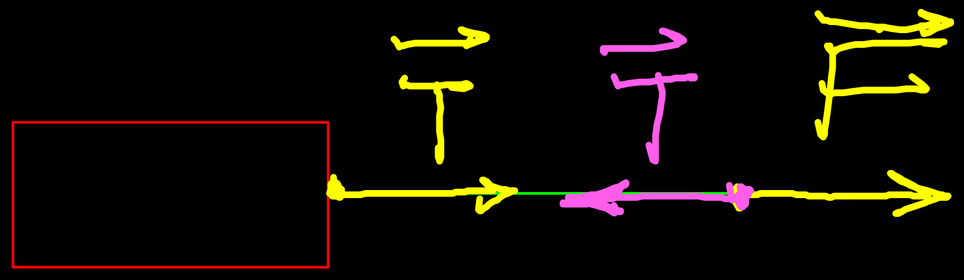
- conosco $\sum \vec{F}$
- sistema inerziale

$\longrightarrow$ ricavo $\vec{a} = \frac{\sum \vec{F}}{m}$

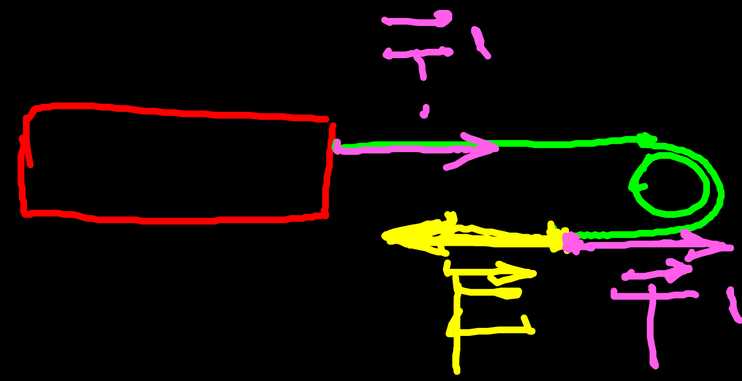
$\frac{d\vec{v}}{dt}$ $\quad$ $\frac{d^2\vec{r}}{dt^2}$ + cond. iniziali $\vec{r}(t=0)$ $\vec{v}(t=0)$

$\longrightarrow \vec{r}(t) \quad \vec{v}(t)$

Esempio 5.4

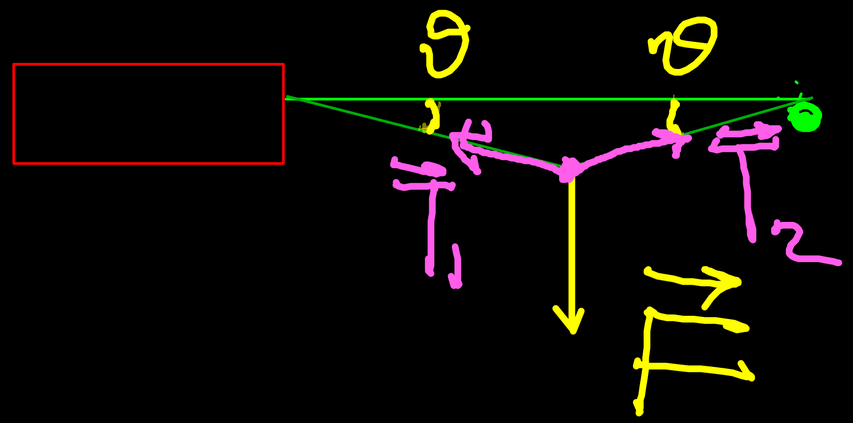


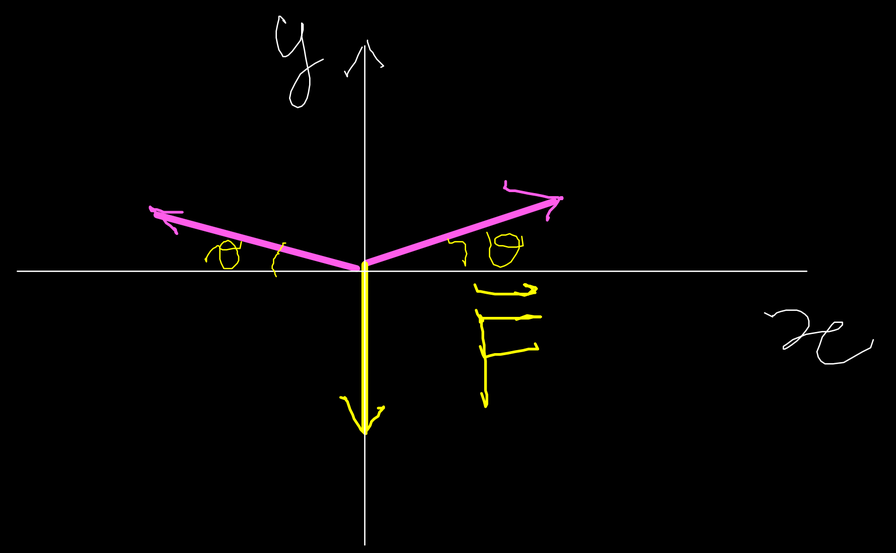
$$T_{max} = 400\ N$$



$$\sum \vec{F} = 0$$

$$\vec{F} + \vec{T}_1 + \vec{T}_2 = 0$$



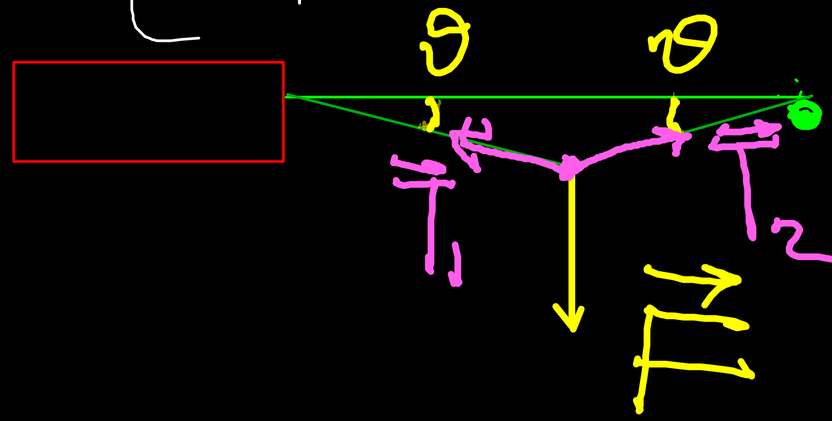


Esempio 5.4

$|\vec{T}_1| = |\vec{T}_2| = T$

lungo x $\begin{cases} 0 + T_{1x} + T_{2x} = 0 \\ -T\cos\theta + T\cos\theta = 0 \end{cases}$

lungo y $\begin{cases} F_y + T_{1y} + T_{2y} = 0 \\ -F + T\sin\theta + T\sin\theta = 0 \end{cases}$



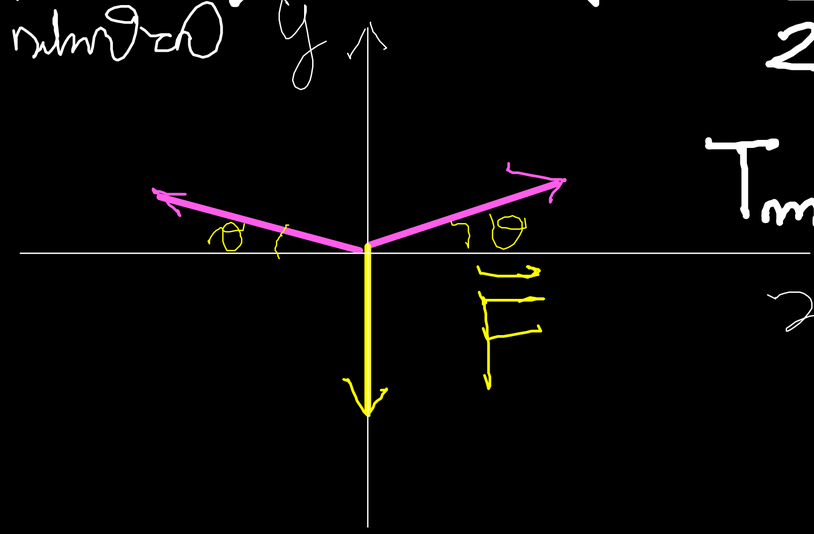
$T = 400\ N$

$\sum \vec{F} = 0$

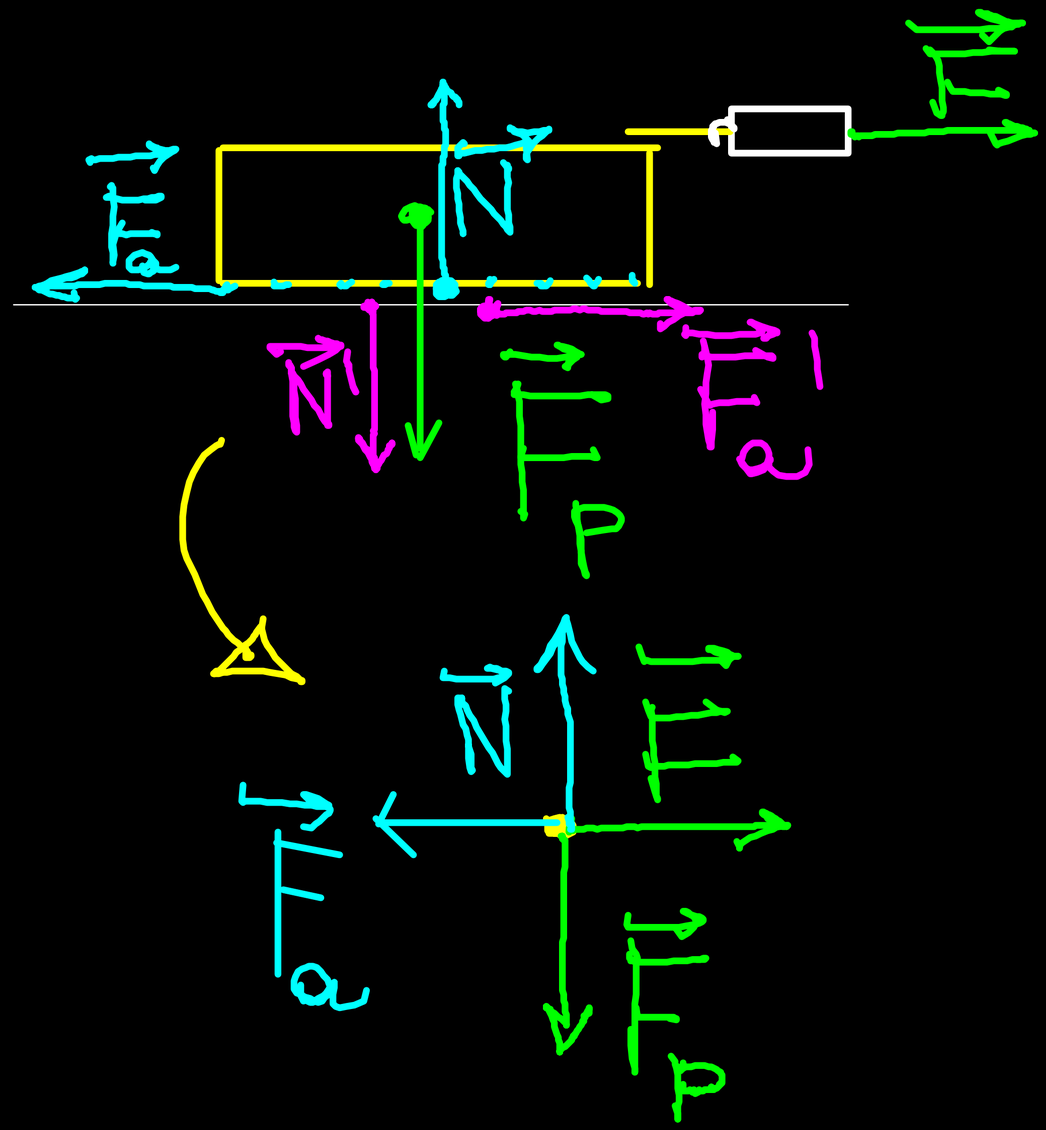
$2T\,\text{sen}\theta = F$

$T = \dfrac{F}{2\,\text{sen}\theta}$

$T_{max} = 1150\ N$



Forze di attrito



$\vec{v}_i = 0$

$\Rightarrow \vec{a}_i = 0$

$\sum \vec{F} = 0$

$|\vec{N}| = |\vec{F}_p|$

$|\vec{F}_a| = |\vec{F}|$

$F_{a\,max}$ pari alla F t.c. si sposta

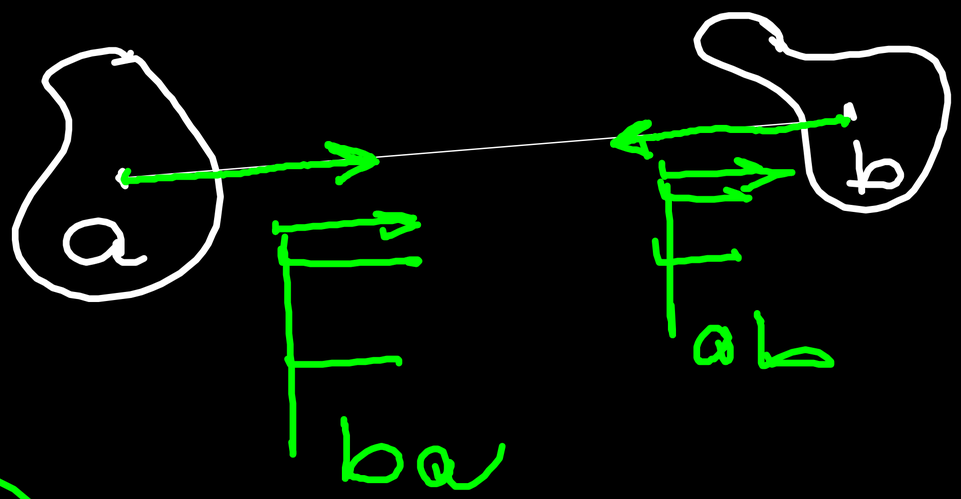
$$F_{a\,max} = \mu N$$

Vale scalarmente sui moduli

μ coeff. attrito statico (adimm.)

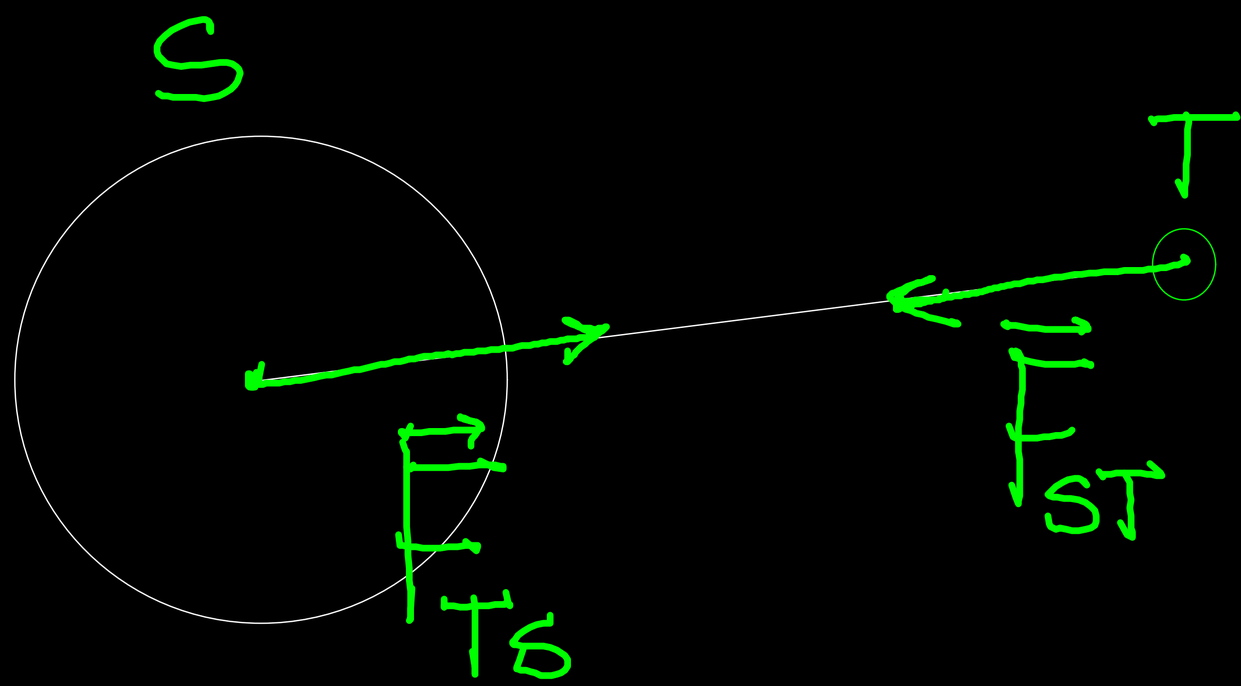
Terza legge di Newton

Principio di Azione e Reazione



$$\vec{F}_{ab} = -\vec{F}_{ba}$$

1) stessa retta di azione
2) punti di applicazione diversi


S
T
$\vec{F}_{ST}$
$\vec{F}_{TS}$