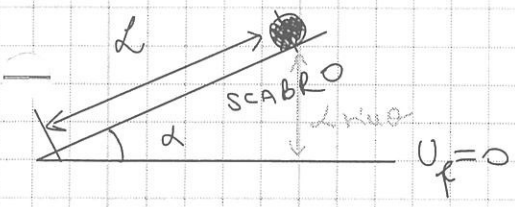
PRETEST
07/06/12



$v_0 = 0$ $\quad \mu_d < tg\alpha$

v al termine del tratto ?

CONSERVAZIONE ENERGIA

F_D non conservativa $\Rightarrow$

$\Delta E = \mathcal{L}_{NC}$

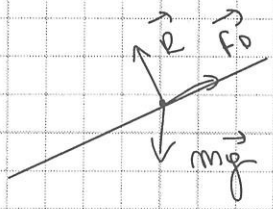
$U_i = mgl\sin\alpha$

$U_f = 0$

$K_i = 0$

$K_f = \frac{1}{2} m v^2$

$\mu_d < tg\alpha = \frac{\sin\alpha}{\cos\alpha}$



$\mathcal{L}_{NC} = \mathcal{L}_{F_D} = F_D \cdot ds \cdot \cos 180 =$

$= -F_D l = -mg\cos\alpha \cdot l\,\mu_0$

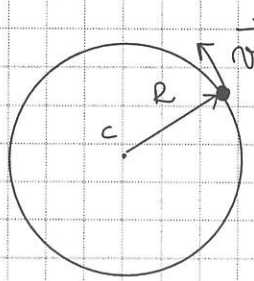
$F_D = \mu_0 \overbrace{mg\cos\alpha}^{R}$

$\frac{1}{2} m v^2 - mgl\sin\alpha = -\mu_0 mgl\cos\alpha$

$gl(-\mu_0\cos\alpha + \sin\alpha) = v_f^2$

$v = \sqrt{2gl(-\mu_0\cos\alpha + \sin\alpha)}$

13/09/12



moto MU

moto MCU

modulo forza totale su corpo ?

$\vec{F}_{tot} = m\vec{a}_c$

$F_{tot} = m\frac{v^2}{R}$

18/07/12

$\vec{F} = f_x \hat{i} + f_y \hat{j}$ $\quad \vec{r} = a \hat{i}$ componenti momento delle forze rispetto al polo O e terna $\hat{i}, \hat{j}, \hat{k}$?

$\vec{M}(O) = \vec{r} \wedge \vec{F} =$

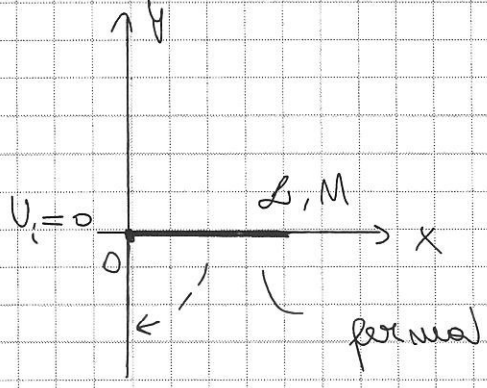
$= \det \begin{pmatrix} \hat{i} & \hat{j} & \hat{k} \\ a & 0 & 0 \\ f_x & f_y & 0 \end{pmatrix} = 0\,\hat{i} - 0\,\hat{j} + (a f_y)\hat{k}$

$|\vec{M}(O)| = a f_y$

27/06/12

NO ATTRITO

L, omogeneo



resta sotto azione forza peso ed è vincolo

CONSERVAZIONE

presa sotto riferimento $U_i = 0$

CM scende di $\frac{L}{2}$ $\quad U_i = 0$ $\quad U_f = -Mg\frac{L}{2}$

$K_f = \frac{1}{2} I_O \omega^2$ $\quad K_i = 0$

I estremo perché è incernierato!

$I_O = \frac{1}{3} M L^2$

$v_{CM} = R\omega$

$-Mg\frac{L}{2} + \frac{1}{2}\frac{1}{3} M L^2 \frac{v_{CM}^2}{\left(\frac{L}{2}\right)^2} = 0$ $\quad \downarrow R = \frac{L}{2}$

$-\frac{g}{2} + \frac{1}{2}\frac{1}{3} \frac{v_{CM}^2}{L^2} L^2 = 0$ $\quad v_{CM} = \sqrt{\frac{3}{4} g L}$

02/07/13

x distanza da estremo di A ($0 \le x \le L$)

sbarra omogenea

b costante positiva

L, $\lambda(x) = \frac{dm}{dx} = bx^2$

distanza CM esta da estremo A scrivo come $x_{CM} = \alpha L$.

α?

$$x_{CM} = \frac{1}{M}\int_0^L x\,\lambda(x)\,dx = \frac{1}{M}\int_0^L x\,bx^2\,dx = \frac{b}{M}\int_0^L x^3\,dx =$$

$$= \frac{b}{M}\frac{L^4}{4}$$

$$M = \int dm = \int_0^L dx\,\lambda(x) = \int_0^L bx^2\,dx =$$

$$= b\frac{L^3}{3}$$

$$x_{CM} = b\frac{L^4}{4}\frac{3}{bL^3} = \frac{3}{4}L = \alpha L \text{ (dal testo)}$$

$$\alpha = \frac{3}{4}$$



10/01/13

$t = 0$ $v_0 = 0$

$a(t) = \alpha t$ a variabile

α costante

spezzo percorso tra $t=0$ e $t=\tau$

$$v(t) = v(t_0) + \int_{t_0}^{t} a(t')\,dt' =$$

$$v(\tau) = 0 + \int_0^\tau a(t)\,dt = \int_0^\tau \alpha t\,dt =$$

$$= \alpha\int_0^\tau t\,dt = \alpha\frac{\tau^2}{2}$$

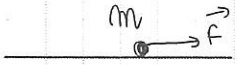
$$x(t) = x(t_0) + \int_{t_0}^{t} v(t')\,dt'$$

$$x(\tau) = 0 + \int_0^\tau v(t)\,dt = \int_0^\tau \alpha\frac{t^2}{2}\,dt = \frac{\alpha}{2}\frac{\tau^3}{3} = \frac{\alpha}{6}\tau^3$$

$$\Delta x = x(\tau) - \cancel{x(0)} = x(\tau) = \frac{\alpha}{6}\tau^3$$

(nullo)

12/06/13

m, fermo a $t=0$ 

$0 \le t \le \tau$

$F(t) = \beta t^2$ β costante $v(t=\tau)$?

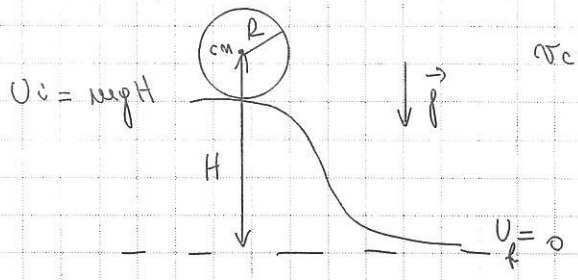
$F = ma$ $\longrightarrow$ $a(t) = \dfrac{F}{m} = \dfrac{\beta t^2}{m}$

$$v(\tau) = 0 + \int_0^{\tau} \frac{\beta t^2}{m}\, dt = \frac{\beta}{m}\,\frac{\tau^3}{3} = \frac{\beta}{3m}\tau^3$$

12/09/13

disco con R, inizio $v(t_0)=0$, centro a H rispetto piano orizzontale

v_{CM}?



$K_i = 0$ fermo

ROTOLAMENTO PURO

$K_f = \frac{1}{2} I_{CM} \omega^2 + \frac{1}{2} m v_{CM}^2$

rotazione traslazione

CONSERVAZIONE

$I_{CM} = \frac{1}{2} m R^2$

$$\frac{1}{4} m R^2 \frac{v_{CM}^2}{R^2} + \frac{1}{2} m v_{CM}^2 = mgH$$

$v_{CM} = \sqrt{\frac{4}{3} gH}$

$v_{CM} = \omega R$

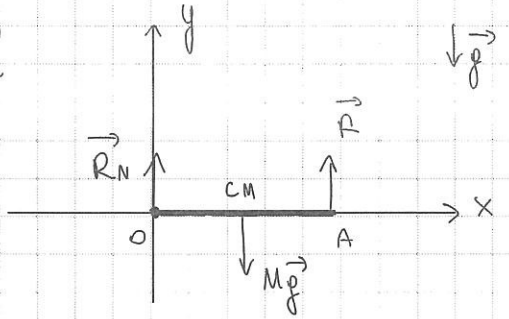
20/02/13

omogeneo, M

FORZA PESO presente

$\vec{F}$ mantiene un eq. bilanciando forza peso

modulo $|\vec{F}|$?



REGOLA MANO DX E POI SE ORARIO NEG. SE ANTIORARIO ← POSITIVO !!

I Cardi. $\vec{F} + M\vec{g} + \vec{R_N} = 0$

II Cardi. RISPETTO O) $F\frac{A}{2} - Mg\frac{A}{2} = 0$ $\Rightarrow$ $F = \frac{Mg}{2}$

06/06/22

$x(t) = x(t_0) + v(t_0)(t-t_0) + \frac{1}{2}a_0(t-t_0)^2$

$v(t_0) = 0$

M.C.U. R non noto

$\vec{a}_T$ cost nota → M.U.A.

$|\vec{a}_{tot}|$?

parte da stesso punto di partenza (1° giro → $2\pi R$)

$2\pi R = \frac{1}{2}a_T t^2 \qquad t = \sqrt{\frac{4\pi R}{a_T}}$ per un giro

$v(t) = v(t_0) + a_0(t-t_0)$

$v(t) = a_T\sqrt{\frac{4\pi R}{a_T}} = \sqrt{4\pi R a_T}$

$\vec{a}_c = \frac{v^2}{R} = \frac{4\pi R a_T}{R} = 4\pi a_T \qquad \vec{a}_{tot} = \vec{a}_T + \vec{a}_c$

$\vec{a}_{tot} = a_T + a_T 4\pi = a_T(1+4\pi)$

$|\vec{a}_{tot}| = \sqrt{a_T^2 + 16\pi^2 a_T^2} = \sqrt{a_T^2(1+16\pi^2)} = a_T\sqrt{1+16\pi^2}$

30/07/13

m ferma, $t=0$ in moto P?

$P = \frac{dL}{dt}$

forza peso P cost, $v(t) = \alpha t^{1/2}$ MR

applico teorema delle forze vive

$L = K_f - K_i = \frac{1}{2}mv^2 - 0 = \frac{1}{2}m(\alpha t^{1/2})^2 = \frac{1}{2}m\alpha^2 t$

$P = \frac{dL}{dt} = \frac{1}{2}m\alpha^2$

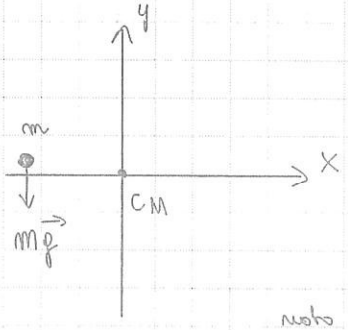
30/01/13 $t = 0^+$ α?

L, rispetto al centro I

forza peso

orizzontale e equilibrio

$t=0$ m in una estremità



II cardinale (rispetto ad O)

$\vec{M}(O) = I_{tot}\vec{\alpha}$

$mg\frac{L}{2} = I_{tot}\alpha$

$I_{tot} = \underbrace{I_0}_{\text{asta}} + \underbrace{m\left(\frac{L}{2}\right)^2}_{\text{noto}} = I + m\frac{L^2}{4}$