

RISOLUZIONE PROVA DI VERIFICA DI FISICA I - 12 CFU (5 MAR 2015)

ESERCIZIO n. 1

COMPONENTI CARTESIANE DEI VETTORI

$$\vec{a} = 2\hat{i} + 3\hat{j}$$

$$\vec{b} = -0.9\hat{i} + 4.9\hat{j}$$

$$\vec{c} = -2.12\hat{i} - 2.12\hat{j}$$

COMPONENTI POLARI

$$\vec{a} \equiv (\sqrt{13}, 56^\circ)$$

$$\vec{b} \equiv (5, 100^\circ)$$

$$\vec{c} \equiv (3, 225^\circ)$$

VERSORI

$$\hat{a} = \frac{2}{\sqrt{13}}\hat{i} + \frac{3}{\sqrt{13}}\hat{j}$$

$$\hat{b} = -\frac{0.9}{5}\hat{i} + \frac{4.9}{5}\hat{j}$$

$$\hat{c} = -\frac{2.12}{3}\hat{i} - \frac{2.12}{3}\hat{j}$$

RISULTATI DELLE OPERAZIONI

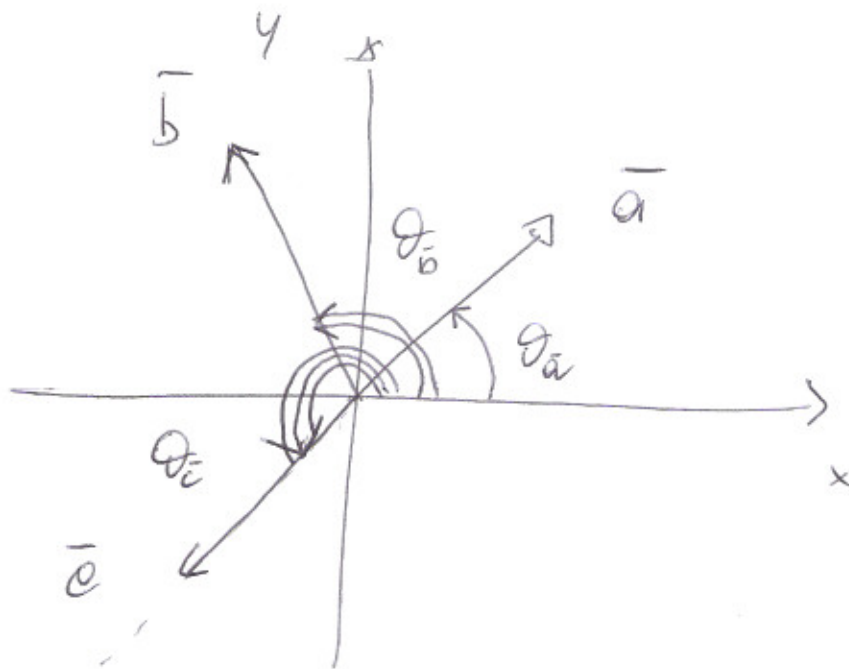
$$\bar{a} + \bar{b} + \bar{c} = -1.02 \hat{i} + 5.78 \hat{j}$$

$$\bar{c} - 2\bar{a} = -6.12 \hat{i} - 8.12 \hat{j}$$

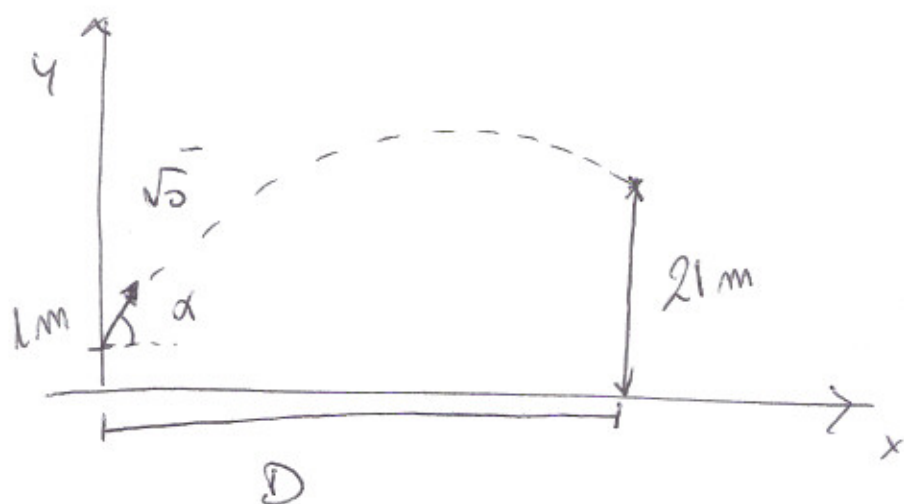
$$(\bar{a} \cdot \bar{b}) + (\bar{b} \cdot \bar{c}) = 4.42$$

$$\bar{b} \times \bar{c} = 12.3 \hat{k}$$

RAPPRESENTAZIONE GRAFICA



ESERCIZIO m. 2



$$h_0 = 1 \text{ m}$$

$$h_{FIN} = 21 \text{ m}$$

$$D = 130 \text{ m}$$

$$\alpha = 35^\circ$$

$$\vec{z}(t) = \vec{z}_0 + \vec{v}_0 t + \frac{1}{2} \vec{a} t^2$$

$$\vec{v}(t) = \vec{v}_0 + \vec{a} t$$

$$\begin{cases} x(t) = x_0 + v_{0x} t + \frac{1}{2} a_x t^2 \\ y(t) = y_0 + v_{0y} t + \frac{1}{2} a_y t^2 \end{cases}$$

$$\begin{cases} v_x(t) = v_{0x} + a_x t \\ v_y(t) = v_{0y} + a_y t \end{cases}$$

$$\begin{cases} x_0 = 0 \\ y_0 = h_0 = 1 \text{ m} \end{cases} \quad \begin{cases} v_{0x} = v_0 \cos \alpha = 0.82 v_0 \\ v_{0y} = v_0 \sin \alpha = 0.54 v_0 \end{cases}$$

$$\begin{cases} a_x = 0 \\ a_y = -g \end{cases} \Rightarrow \begin{cases} x(t) = 0.82 v_0 t \\ y(t) = 1 + 0.54 v_0 t - \frac{1}{2} g t^2 \\ v_x(t) = 0.82 v_0 \\ v_y(t) = 0.54 v_0 - g t \end{cases}$$

$$t = t^* \quad x(t^*) = 130 \text{ m}$$

$$y(t^*) = 21 \text{ m}$$

$$\begin{cases} 130 = 0.82 \sqrt{v_0} t^* \\ 21 = 1 + 0.54 \sqrt{v_0} t^* - \frac{1}{2} g t^{*2} \end{cases}$$

$$t^* = 3.8 \text{ s}$$

$$v_0 = 41.7 \text{ m/s}$$

$$v_x(t^*) = 0.82 v_0$$

$$v_x(t^*) = 34.1 \text{ m/s}$$

$$v_y(t^*) = 0.54 v_0 - g t^*$$

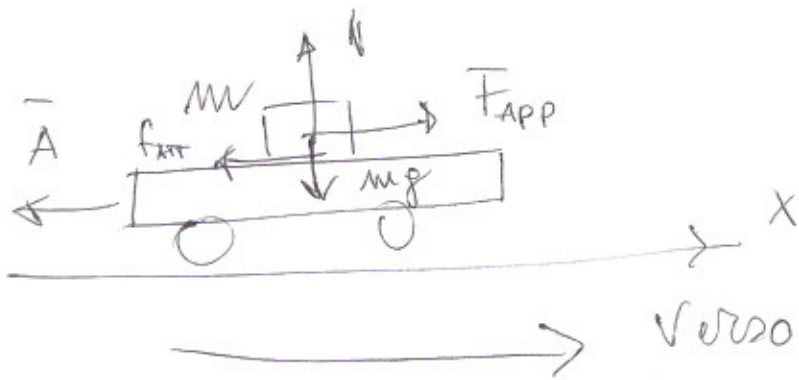
$$v_y(t^*) = -13.5 \text{ m/s}$$

$$|\vec{v}(t^*)| = 36.7 \text{ m/s}$$

Esercizio n. 3

$$M = 3.8 \text{ kg}$$

$$\mu = 0.650$$



Sistema di ref. solidale all'auto

$$\begin{cases} +F_{APP} - f_{ATT} = m a'_x \\ N = mg \end{cases}$$

$$|F_{APP}| = m |A|$$

$$|f_{ATT}| \leq \mu N \quad |f_{ATT}| \leq \mu mg$$

$$A : \begin{cases} x(t) = x_0 + v_{0x}t + \frac{1}{2} a_x t^2 \\ v_x(t) = v_{0x} + a_x t \end{cases}$$

$$x_0 = 0$$

$$v_{0x} = +72 \text{ km/h} = 20 \text{ m/s}$$

$$a_x < 0$$

$$\begin{cases} x(t) = +20t - \frac{1}{2} a_x t^2 \\ v_x(t) = +20 - a_x t \end{cases}$$

$$v_x(t^*) = 0$$

$$x(t^*) = 45 \text{ m}$$

da cui si ricorre $t^* = 4.5 \text{ s}$

$$a_x = -4.44 \text{ m/s}^2$$

$$|\bar{A}| = |a_x| = 4.44 \text{ m/s}^2$$

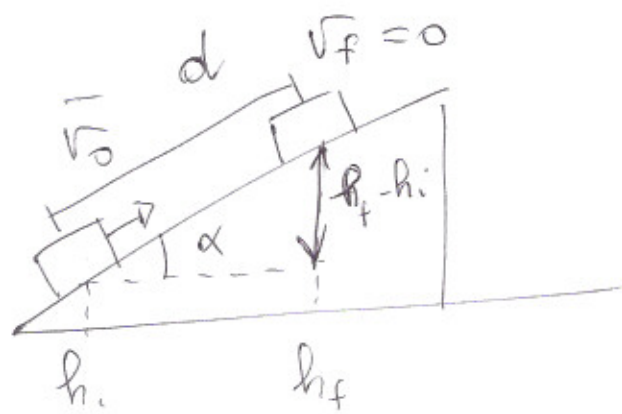
$$\cancel{m}|\bar{A}| - \cancel{m}g = \cancel{m}a_x'$$

$$|g| = 6.37 \text{ m/s}^2$$

$$|\bar{A}| - \mu mg < 0$$

IL LIBRO NON
SCIVOLA DAL SEDILE

ESERCIZIO n. 4



$$m = 5 \text{ kg}$$

$$\alpha = 30^\circ$$

$$v_0 = 8 \text{ m/s}$$

$$d = 3 \text{ m}$$

$$v_f = 0$$

$$\Delta K = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_0^2$$

$$\Delta K = 0 - \frac{1}{2} m v_0^2 \quad \Delta K = -\frac{1}{2} m v_0^2$$

$$\Delta K = -160 \text{ J}$$

$$\Delta U = U_f - U_i = mgh_f - mgh_i =$$

$$= mg(h_f - h_i)$$

$$(h_f - h_i) = d \sin \alpha \quad (h_f - h_i) = 1.5 \text{ m}$$

$$\Delta U = mg(h_f - h_i) \quad \Delta U = 73.5 \text{ J}$$

$$E_{\text{DISS}} = |\Delta K| - |\Delta U| = 86.5 \text{ J}$$

$$E_{\text{DISS}} = -d(\bar{f}_{\text{ATT}}) = -d|\bar{f}_{\text{ATT}}| \quad |\bar{f}_{\text{ATT}}| = 28.8 \text{ N}$$

$$|\bar{f}_{\text{ATT}}| \leq \mu mg \cos \alpha \quad \mu = 0.678$$