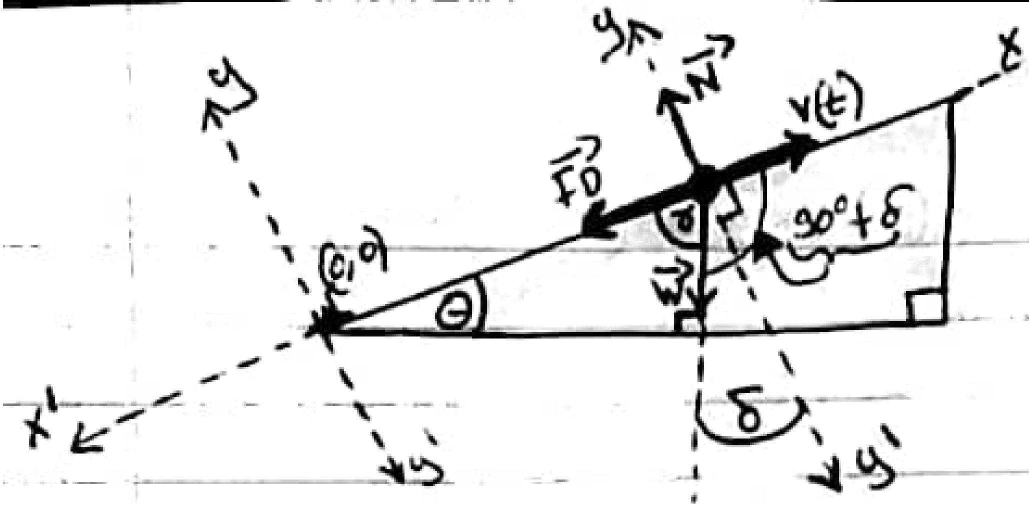

Δεδομένα

m, θ, v_0

$F_D = -B|\vec{v(t)}|\,\vec{i}$

Λύση: $\theta + \gamma + 90^\circ = 180^\circ \Leftrightarrow \boxed{\gamma = 90^\circ - \theta}$ (1)

- $\gamma + \delta = 90^\circ \Leftrightarrow \cancel{90^\circ} - \theta + \delta = \cancel{90^\circ} \Rightarrow \boxed{\delta = \theta}$ (2)

- $\arg(\vec{w}) = -(90^\circ + \delta) = -(90^\circ + \theta) \Rightarrow \boxed{\arg(\vec{w}) = -90^\circ - \theta}$ (3)

- $\vec{w} = m \cdot g \cdot \cos(-90^\circ - \theta)\,\vec{i} + \underbrace{m \cdot g \cdot \sin(-90^\circ - \theta)}_{-m \cdot g \cdot \sin(\theta + 90^\circ)}\,\vec{j}$

$= m \cdot g \cdot \sin(\cancel{-90^\circ} \cancel{+90^\circ} - \theta)\,\vec{i} - m \cdot g \cdot \cos[(\theta \cancel{+90^\circ} \cancel{-90^\circ})]$

$$\Rightarrow \boxed{\vec{w} = -m \cdot g \cdot \sin(\theta)\,\vec{i} - m \cdot g \cdot \cos(\theta)\,\vec{j}}$$ (4)

[redacted] κα

[redacted] =0

v(t) [redacted] ου

- Έστω $v(t) = 0$ (ακίνητο) και $\Sigma\vec{F} = 0$

$\Leftrightarrow \vec{F_D} + \vec{F_N} + \vec{F_W} = 0 \Leftrightarrow \cancel{-B|\vec{v(t)}|}^{\to 0} + y\vec{j} = -\vec{F_W}$

$\Leftrightarrow y\vec{j} = m \cdot g \cdot \sin(\theta)\,\vec{i} + m \cdot g \cdot \cos(\theta)\,\vec{j} \Rightarrow \boxed{\vec{F_N} = y\vec{j} = m \cdot g \cdot \cos(\theta)\,\vec{j}}$ (5)

$\underline{m \cdot g \cdot \sin(\theta)\,\vec{i} = 0}$

$$\Sigma\vec{F} = m\cdot\vec{a} \Leftrightarrow \vec{F_D} + \vec{F_N} + \vec{F_W} = m\cdot\frac{\partial \vec{V(t)}}{\partial t}$$

$$\Leftrightarrow -B\left|\vec{v(t)}\right|\vec{i} + \cancel{m g\cdot\cos(\theta)\vec{j}} - m\cdot g\cdot\sin(\theta)\vec{i} - \cancel{m\cdot g\cdot\cos(\theta)\vec{j}} = m\frac{\partial|\vec{v(t)}|}{\partial t}\vec{i}$$

$$\Leftrightarrow -B\left|\vec{v(t)}\right|\cancel{\vec{i}} - m\cdot g\cdot\sin(\theta)\cancel{\vec{i}} = m\frac{\partial|\vec{v(t)}|}{\partial t}\cancel{\vec{i}}$$

$$\Leftrightarrow m\frac{\partial|\vec{v(t)}|}{\partial t} + B\left|\vec{v(t)}\right| = -m\cdot g\cdot\sin(\theta)$$

$$\Leftrightarrow \frac{\partial|\vec{v(t)}|}{\partial t} + \frac{B}{m}\left|\vec{v(t)}\right| = -g\cdot\sin(\theta)$$

Let $\lambda = e^{\int\frac{B}{m}\partial t} \Rightarrow \lambda = e^{\frac{B}{m}t + c}$

$$\frac{\partial|\vec{v(t)}|}{\partial t}\cdot e^{\frac{B}{m}\cdot t} + \frac{B}{m}\left|\vec{v(t)}\right|\cdot e^{\frac{B}{m}\cdot t} = -g\cdot\sin(\theta)\, e^{\frac{B}{m}\cdot t}$$

$$\Leftrightarrow \left[\left|\vec{v(t)}\right|\cdot e^{\frac{B}{m}\cdot t}\right]' = -g\cdot\sin(\theta)\cdot e^{\frac{B}{m}\cdot t}$$

$$\left|\vec{v(t)}\right|\cdot e^{\frac{B}{m}\cdot t} = -g\cdot\sin(\theta)\left[\frac{m}{B}\cdot e^{\frac{B}{m}\cdot t} + c\right]$$

$$\Leftrightarrow \boxed{\left|\vec{v(t)}\right| = -g\cdot\sin(\theta)\left[\frac{m}{B} + c\cdot e^{-\frac{B}{m}\cdot t}\right]} = \vec{v(t)}$$

(6) αφου $\vec{v(t)}$ προς την θετική φορά

$$\vec{v(0)} = V_0 = -g\cdot\sin(\theta)\left[\frac{m}{B} + c\right]$$

$$= -g\cdot\sin(\theta)\cdot\frac{m}{B} - g\cdot\sin(\theta)\cdot c = V_0 \Rightarrow \cancel{c = -g\cdot\sin(\theta)}$$

$$\boxed{c = \frac{-\frac{g\cdot m}{B}\cdot\sin(\theta) - V_0}{g\cdot\sin\theta}}$$

(7) θα το κρατήσω c όπως πρέπει.

$$\frac{\partial S}{\partial t} = \vec{V(t)} \Leftrightarrow \partial S = V(t)\,\partial t \Leftrightarrow \int_{S(0)}^{S(t)} \partial S = \int_0^t V(t)\,\partial t$$

$$\Leftrightarrow S(t) - S(0) = \int_0^t -g\cdot\sin(\theta)\left[\frac{m}{B} + c\cdot e^{-\frac{B}{m}t}\right]\partial t$$

$$= -g\cdot\sin(\theta)\int_0^t \frac{m}{B} + c\cdot e^{-\frac{B}{m}t}\,\partial t$$

$$= -g\cdot\sin(\theta)\left[\frac{m}{B}\cdot t - \frac{c\cdot m}{B}\cdot e^{-\frac{B}{m}\cdot t}\right]_0^t$$

$$= -g\cdot\sin(\theta)\left[\frac{m}{B}\cdot t - \frac{c\cdot m}{B}\cdot e^{-\frac{B}{m}\cdot t} - \left(0 - \frac{c\cdot m}{B}\right)\right]$$

$$\Rightarrow \boxed{S(t) = -g\cdot\sin(\theta)\left[\frac{m}{B}\cdot t - \frac{c\cdot m}{B}\cdot e^{-\frac{B}{m}\cdot t} + \frac{c\cdot m}{B}\right] + S(0)} \quad 8$$

Όπου $\boxed{c = \dfrac{-\frac{g\cdot m}{B}\cdot\sin(\theta) - V_0}{g\cdot\sin(\theta)}}$.

Από την (6) Για $V(t) = 0$ έχουμε

$$0 = -g\sin(\theta)\cdot\frac{m}{B} - g\cdot c\cdot\sin(\theta)\cdot e^{-\frac{B}{m}\cdot t}$$

$$\Leftrightarrow g\cdot c\cdot\sin(\theta)\cdot e^{-\frac{B}{m}\cdot t} = -g\cdot\sin(\theta)\cdot\frac{m}{B}$$

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$$\Leftrightarrow e^{-\frac{B}{m}t} = \frac{-\cancel{g}\cdot \cancel{\sin(\theta)}\cdot \frac{m}{B}}{\cancel{g}\cdot c\cdot \cancel{\sin(\theta)}} \Leftrightarrow \boxed{e^{-\frac{B}{m}\cdot t} = -\frac{m}{c\cdot B}} \quad (9)$$

$$\cancel{\Leftrightarrow -\frac{B}{m}t =} \quad c = \frac{-\frac{g\cdot m}{B}\cdot \sin(\theta) - V_0}{g\cdot \sin(\theta)} = \boxed{-\frac{\frac{g\cdot m}{B}\cdot \sin(\theta) + V_0}{g\cdot \sin(\theta)} = c} \quad (10)$$

$$\cancel{\Leftrightarrow e}$$

$$(9):(10) \quad e^{-\frac{B}{m}\cdot t} = \cancel{-}\frac{m}{\cancel{-}\frac{\frac{g\cdot m}{B}\cdot \sin(\theta) + V_0}{g\cdot \sin(\theta)}\cdot B}$$

$$e^{-\frac{B}{m}\cdot t} = \frac{m}{\frac{g\cdot m\cdot \sin(\theta) + BV_0}{g\cdot \sin(\theta)}} = \frac{m\cdot g\cdot \sin(\theta)}{m\cdot g\cdot \sin(\theta) + BV_0}$$

$$\Leftrightarrow -\frac{B}{m}t = \ln\left[\frac{m\cdot g\cdot \sin(\theta)}{m\cdot g\cdot \sin(\theta) + BV_0}\right]$$

$$\boxed{t = -\frac{m}{B}\cdot \ln\left[\frac{m\cdot g\cdot \sin(\theta)}{m\cdot g\cdot \sin(\theta) + BV_0}\right]}$$

Σε αυτόν τον χρόνο, θα σταματήσει το κινητό.

t @ $V(t) = 0$ (stops moving upwards)