Ασκ. 3.42

$a_{K(0)} = \omega_0^2 R$

$a_{\varepsilon(0)} = 2\omega_0^2 R = 2a_{K(0)}$

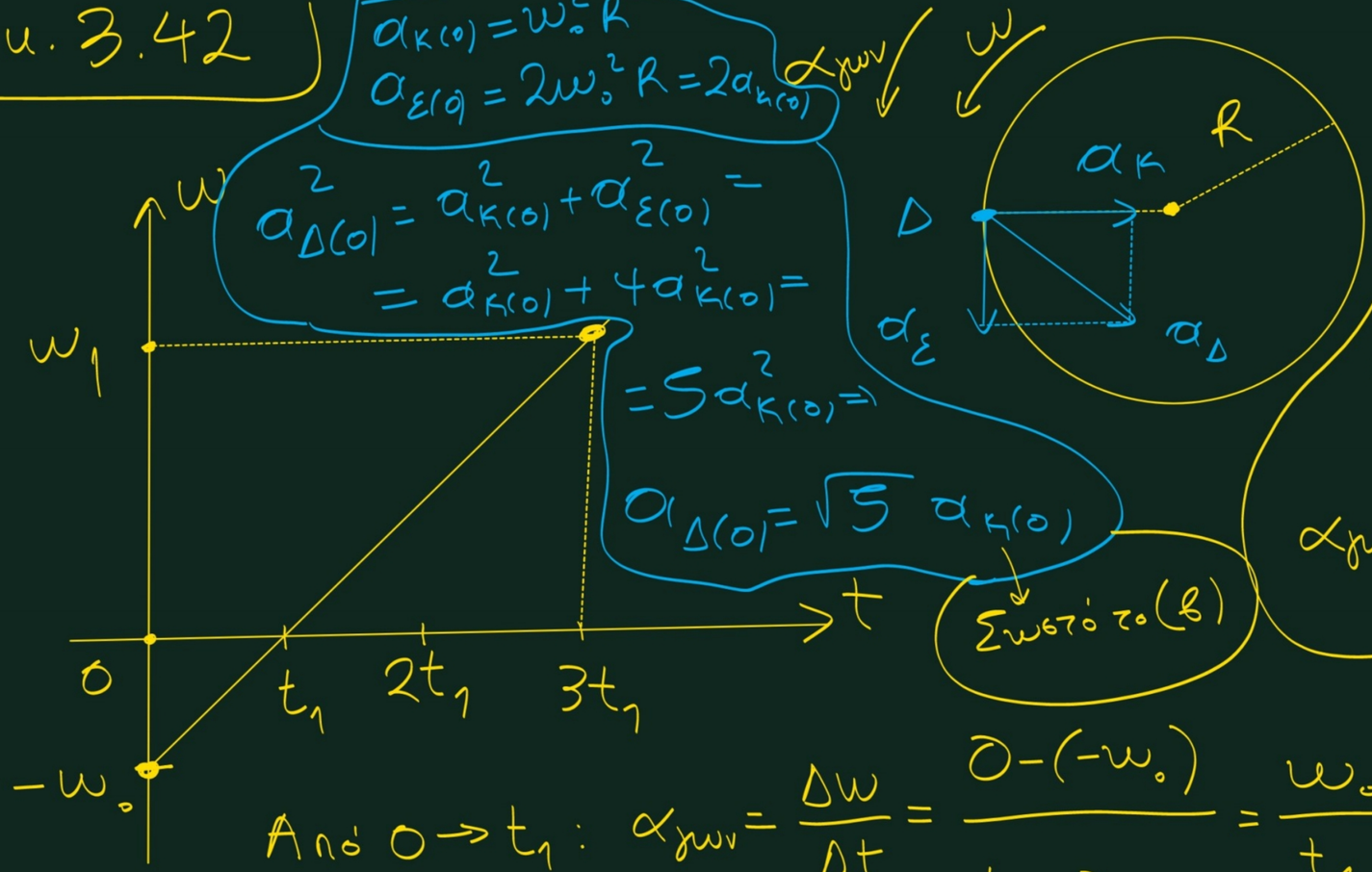
$a_{\Delta(0)}^2 = a_{K(0)}^2 + a_{\varepsilon(0)}^2 =$

$= a_{K(0)}^2 + 4a_{K(0)}^2 =$

$= 5a_{K(0)}^2 \Rightarrow$

$a_{\Delta(0)} = \sqrt{5}\, a_{K(0)}$

Σωστό το (β)



$a_{K(0)} = \omega_0^2 \cdot R$

$a_{\varepsilon(0)} = \alpha_{\gamma\omega\nu} \cdot R$

Τη στιγμή $3t_1$ έχουμε:

$a_{\varepsilon(1)} = \dfrac{a_{K(1)}}{2} \Rightarrow$

$\alpha_{\gamma\omega\nu} \cdot R = \dfrac{\omega_1^2 \cdot R}{2} \Rightarrow \alpha_{\gamma\omega\nu} = \dfrac{4\omega_0^2}{2} \Rightarrow$

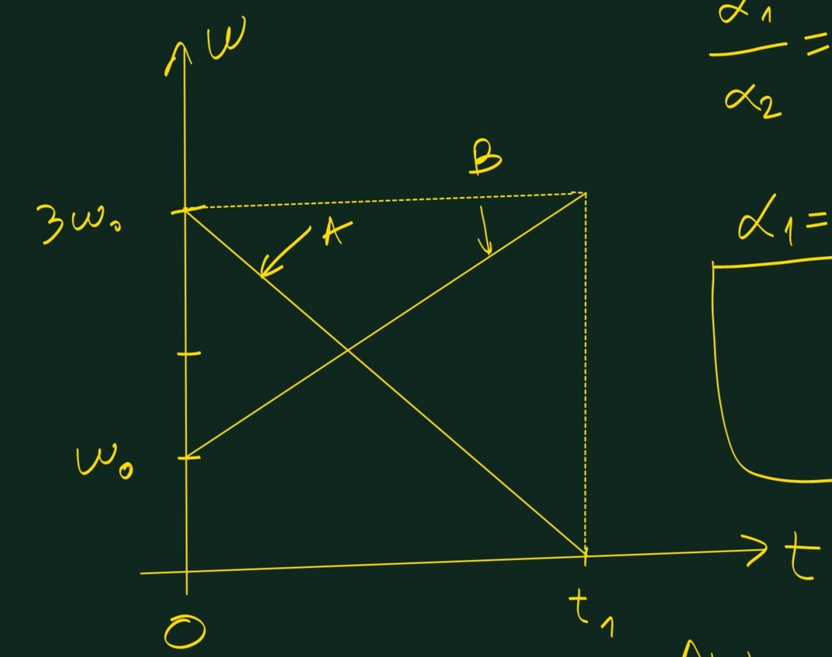
$\alpha_{\gamma\omega\nu} = 2\omega_0^2$

Από $0 \to t_1$: $\alpha_{\gamma\omega\nu} = \dfrac{\Delta\omega}{\Delta t} = \dfrac{0-(-\omega_0)}{t_1 - 0} = \dfrac{\omega_0}{t_1}$

Από $t_1 \to 3t_1$: $\alpha_{\gamma\omega\nu} = \dfrac{\Delta\omega}{\Delta t} = \dfrac{\omega_1 - 0}{3t_1 - t_1} = \dfrac{\omega_1}{2t_1}$

$\Rightarrow \dfrac{\omega_0}{t_1} = \dfrac{\omega_1}{2t_1} \Rightarrow \omega_1 = 2\omega_0$

Ασκ. 3.41



α) i) Για το (Α): $\alpha_1 = \frac{\Delta w}{\Delta t} = \frac{0 - 3w_0}{t_1 - 0} = -\frac{3w_0}{t_1}$

Για το (Β): $\alpha_2 = \frac{\Delta w}{\Delta t} = \frac{3w_0 - w_0}{t_1 - 0} = \frac{2w_0}{t_1}$

$$\frac{\alpha_1}{\alpha_2} = \frac{-\frac{3w_0}{t_1}}{\frac{2w_0}{t_1}} = -\frac{3}{2} = -1,5 \Rightarrow$$

$\alpha_1 = -1,5\alpha_2$ Σωστό το (iii)

β) i) Για το Α: $\Delta\theta_1 = \frac{3w_0 \cdot t_1}{2}$

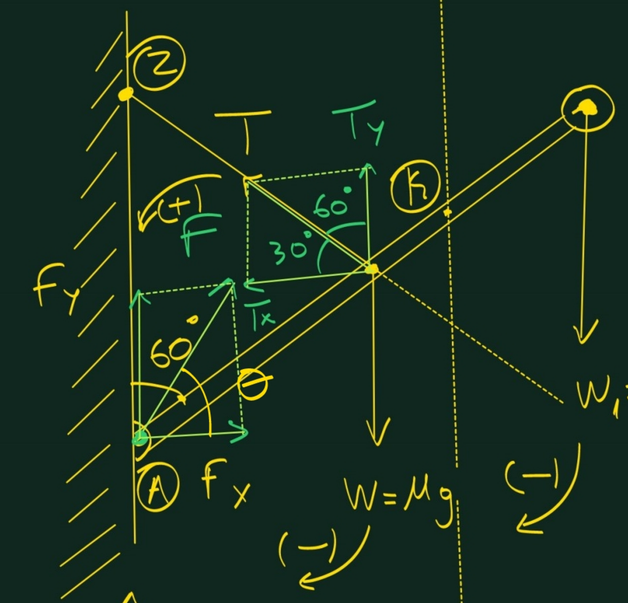
Για το Β: $\Delta\theta_2 = \frac{w_0 + 3w_0}{2} \cdot t_1 = 2w_0 t_1$

$$\frac{\Delta\theta_1}{\Delta\theta_2} = \frac{\frac{3w_0 t_1}{2}}{2w_0 t_1} = \frac{3}{4} \Rightarrow$$

$\Delta\theta_1 = 0,75\Delta\theta_2$

Σωστό το (iii)

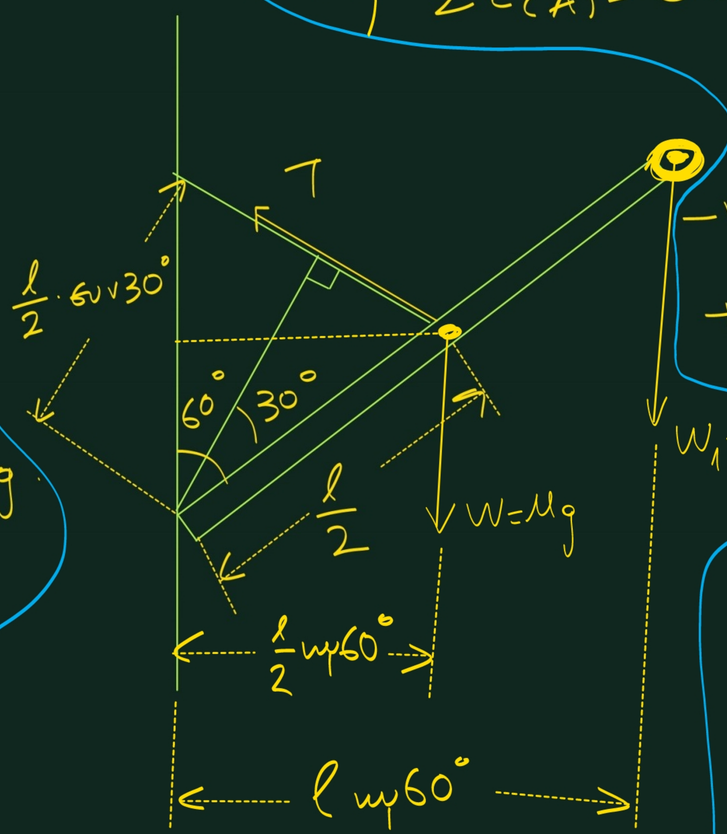
Άσκ. 4.149



Το ΑΚΖ είναι ισοσκελές αφού

$AK=KZ=\frac{\ell}{2}$

και ισόπλευρο αφού $\hat{ZAK}=60^\circ$



Θ) $\Sigma\tau_{(A)}=0\Rightarrow \tau_{W(A)}+\tau_{W_1(A)}+$

$+\tau_{T(A)}=0\Rightarrow$

$-W\cdot\frac{\ell}{2}\cdot\eta\mu60^\circ-W_1\cdot\ell\cdot\eta\mu60^\circ+$

$+T\cdot\frac{\ell}{2}\cdot\sigma\upsilon\nu30^\circ=0\Rightarrow$

$T\cdot\frac{\ell}{2}\cdot\sigma\upsilon\nu30^\circ=$

$=Mg\frac{\ell}{2}\eta\mu60^\circ+mg\ell\eta\mu60^\circ\Rightarrow$

$(\sigma\upsilon\nu30^\circ=\eta\mu60^\circ)$

$\frac{T}{2}=\frac{Mg}{2}+mg\Rightarrow$

$T=Mg+2mg=60+2\cdot20\Rightarrow$

$T=100N$

β) $\Sigma F_x = 0 \Rightarrow F_x - T_x = 0 \Rightarrow$

$F_x - T \cdot \sigma\upsilon\nu 60^\circ = 0 \Rightarrow$

$F_x = 100 \frac{\sqrt{3}}{2} \Rightarrow F_x = 50\sqrt{3}\ N$

$\Sigma F_y = 0 \Rightarrow F_y + T_y - W - W_1 = 0 \Rightarrow$

$F_y + T \cdot \eta\mu 60^\circ - Mg - mg = 0 \Rightarrow$

$F_y + 100 \cdot \frac{1}{2} - 60 - 20 = 0 \Rightarrow$

$F_y = 80 - 50 = 30N$

$F^2 = F_x^2 + F_y^2 = 50^2 \cdot 3 + 30^2 = 2500 \cdot 3 + 900 =$

$= (75+9) \cdot 100 = 84 \cdot 100 = 21 \cdot 400 \Rightarrow$

$F = 20\sqrt{21}\ N$

$\varepsilon\varphi\theta = \frac{F_y}{F_x} = \frac{30}{50 \cdot \sqrt{3}} = \frac{\sqrt{3}}{5}$

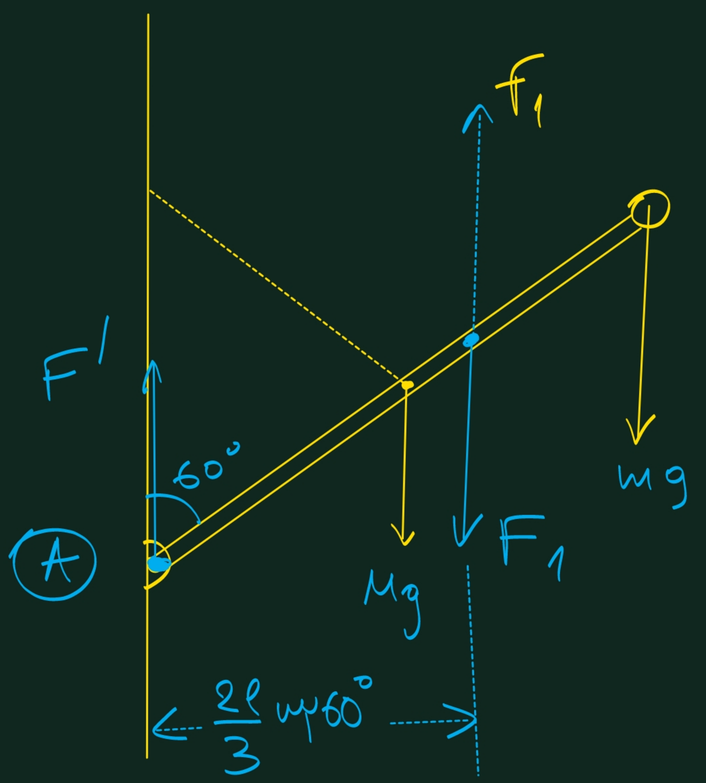
γ) Όσο υπάρχει η τάση Τ η F δεν μπορεί να είναι κατακόρυφη λόγω της

$T_x = T \cdot \eta\mu 60^\circ$

Άρα πρέπει να ισχύει:

$T = 0$

γ)



$$\Sigma\tau_{(A)}=0 \Rightarrow$$

$$\tau_{F_1(A)}+\tau_{W(A)}+\tau_{W_1(A)}=0 \Rightarrow$$

$$F_1\cdot\frac{2l}{3}\sigma\upsilon 60^\circ + Mg\frac{l}{2}\sigma\upsilon 60^\circ + mgl\sigma\upsilon 60^\circ = 0 \Rightarrow$$

$$\frac{2F_1}{3}+\frac{Mg}{2}+mg=0 \Rightarrow$$

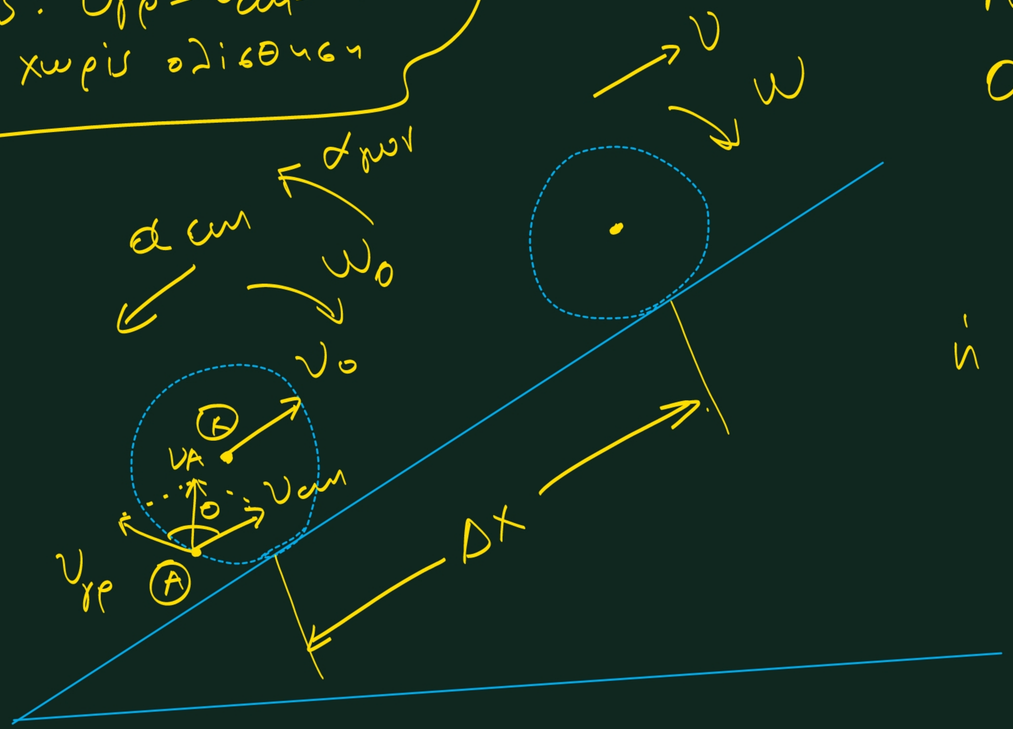
$$\frac{2F_1}{3}+30+20=0 \Rightarrow$$

$$2F_1=-150 \Rightarrow F_1=-75N$$

Άρα η F_1 έχει μέτρο 75N και φορά προς τα <u>πάνω</u>.

Για σημεία της περιφέρειας: $v_{\gamma\rho} = v_{cm} = \omega R$

για κύλιση χωρίς ολίσθηση



Αν το σώμα κυλίεται με επιβράδυνση α_{cm}, έχουμε:

$$\Delta x = v_0 \cdot \Delta t - \frac{1}{2} \alpha_{cm} \Delta t^2$$

ή $$R \cdot \Delta\theta = \omega_0 R \cdot \Delta t - \frac{1}{2} \alpha_{\gamma\omega\nu} R \cdot \Delta t^2 \Rightarrow$$

$$\Delta\theta = \omega_0 \cdot \Delta t - \frac{1}{2} \alpha_{\gamma\omega\nu} \cdot \Delta t^2$$

και: $$v = v_0 - \alpha_{cm} \Delta t$$

$$\omega = \omega_0 - \alpha_{\gamma\omega\nu} \Delta t$$

Το τυχαίο σημείο του σώματος έχει ταχύτητα: $v_A^2 = v_{\gamma\rho}^2 + v_{cm}^2 + 2 v_{\gamma\rho} \cdot v_{cm} \sigma\upsilon\nu\theta \Rightarrow$

$$v_A^2 = 2 v_{cm}^2 + 2 v_{cm}^2 \sigma\upsilon\nu\theta \Rightarrow v_A = v_{cm} \sqrt{2(1+\sigma\upsilon\nu\theta)}$$