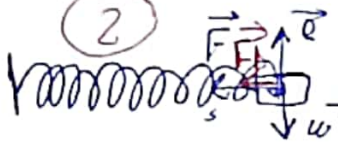
تسلم مادة الفيزياء - 4 -
لطلاب السنة الثالثة ع.ف



السؤال الأول: $\sum \vec{F} = m\vec{a}$

$\vec{w} + \vec{R} + \vec{F_s} + \vec{F_b} = m\vec{a}$

$0 + 0 - kx - bv = ma \Rightarrow m\frac{d^2x}{dt^2} + b\frac{dx}{dt} + kx = 0$ (3)

$\frac{d^2x}{dt^2} + \frac{b}{m}\frac{dx}{dt} + \frac{k}{m}x = 0 \Rightarrow \frac{d^2x}{dt^2} + 2\gamma\frac{dx}{dt} + \omega^2 x = 0$

نفرض $x = e^{rt}$ (2) $\Leftarrow r^2 e^{rt} + 2\gamma r e^{rt} + \omega^2 e^{rt} = 0$

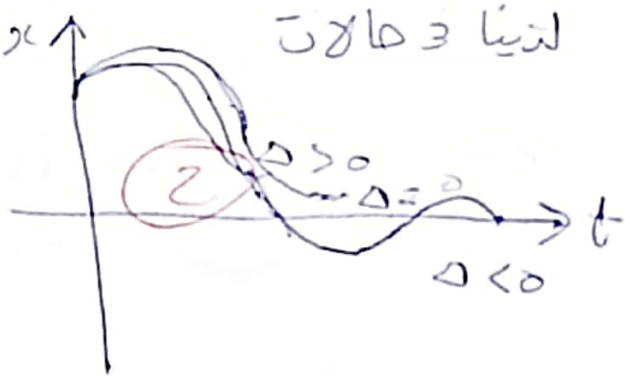
$r^2 + 2\gamma r + \omega^2 = 0$ (3) $\Delta = 4\gamma^2 - 4\omega^2$

$\Delta > 0$ (3) حلول متمايزة

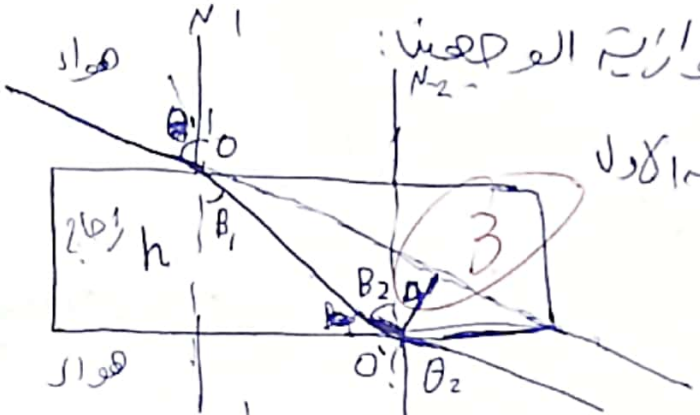
$\Delta = 0$ (2) حل وحيد

$\Delta < 0$ (3) حلول مترافقة

لدينا 3 حالات



السؤال الثاني: دراسة توازن الوجه الأول:



نطبق قانون الانكسار على الوجه الأول

(2) $n_1 \sin\theta_1 = n_2 \sin B_1$

(3) $\sin\theta_1 = n_1 \sin B_1$

لكن $n_2 \sin B_2 = \sin\theta_2$ للتبادل الراضي $B_1 = B_2$ (2)

$\Rightarrow \sin\theta_1 = \sin\theta_2$ (2)

$\theta_1 = \theta_2$

الطلب الثاني في الدرس:

$$\sin(\theta - B) = \frac{\Delta}{OO'}$$

$$\sin\theta\cos B - \cos\theta\sin B = \frac{\Delta}{OO'}$$

$$n\sin B\cos B - \cos\theta\sin B = \frac{\Delta}{OO'}$$

$$\sin B(n\cos B - \cos\theta) = \frac{\Delta}{OO'}$$

$$\cos B = \frac{h}{OO'} \Rightarrow OO' = \frac{h}{\cos B}$$

$$\Delta = OO'\sin B(n\cos B - \cos\theta)$$

$$\Delta = h\sin B\left(n - \frac{\cos\theta}{\cos B}\right)$$

السؤال الثالث:

$$v = \sqrt{\frac{F_T}{\mu}} = \sqrt{\frac{140}{0,14}} = \sqrt{\frac{14000}{14}} = \sqrt{1000} = 10\sqrt{10}\ m.s^{-1}$$

$$\lambda = v.T = \frac{v}{f} = \frac{10\sqrt{10}}{25\pi} = 0,4\ m$$

$$y = A\sin(kx + \omega t + \phi)$$

شروط البدء:

$y = 2\times10^{-2}\ m \quad t = 0s$

$A = 4\times10^{-2}\ m \quad x = 0$

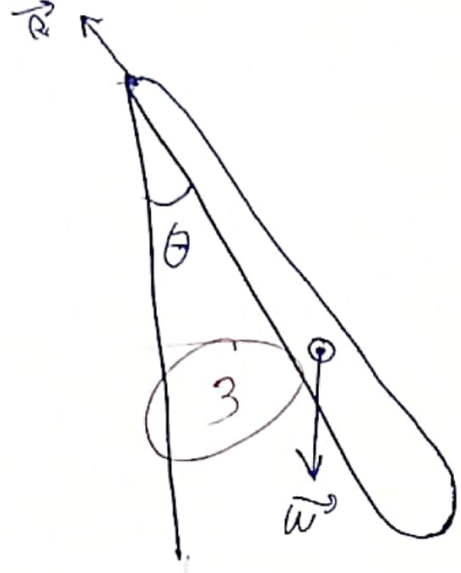
$$2\times10^{-2} = 4\times10^{-2}\sin\theta \Rightarrow \sin\theta = \frac{1}{2}$$

$$\theta = \frac{\pi}{6}$$

$$k = \frac{2\pi}{\lambda} = \frac{2\pi}{0,4} = 5\pi$$

$$\omega = 2\pi f = 500\ Rad.s^{-1}$$

$$y = 0,04\sin\left(5\pi x - 500t + \frac{\pi}{6}\right)$$



السؤال الرابع:

$$\sum \mathcal{M}_{\vec{R}/\Delta} + \sum \mathcal{M}_{\vec{w}/\Delta} = I_\Delta \bar{\alpha}$$

$$0 - mgd\sin\theta = I_\Delta \bar{\alpha}$$

$\theta \leq 14°$ (3) $\sin\theta \approx \theta$

$$-mgd\theta = I_\Delta (\theta)''_t$$

$$(\theta)''_t = -\frac{mgd}{I_\Delta}\bar{\theta}$$

معادلة تفاضلية تقبل حلاً جيبياً

(3)

$$\bar{\theta} = \theta_{max}\cos(\omega t + \bar{\varphi})$$

$$(\theta)'_t = -\omega\theta_{max}\sin(\omega t + \bar{\varphi})$$

$$(\theta)''_t = -\omega^2\theta_{max}\cos(\omega t + \bar{\varphi}) = -\omega^2\bar{\theta}$$ (3)

$$\omega^2 = \frac{mgd}{I_\Delta} \Rightarrow T = \frac{2\pi}{\omega}$$

(3)

$$T = 2\pi\sqrt{\frac{I_\Delta}{mgd}}$$