15.42

torsdag 5 januari 2023 10:49

$\alpha(1) = ???$

$L = 92\ m$

$\alpha(0) = 3^\circ = \pi/60$ $\quad g = 9{,}82\ m/s^2$ $\quad \alpha'(0) = 0$

$30^\circ = \pi/6 \quad 3^\circ = \pi/60$

$$\frac{d^2\alpha}{dt^2} + \frac{g}{L}\sin\alpha = 0 \iff \alpha''(t) + \frac{g}{L}\sin\alpha \approx \alpha''(t) + \frac{g}{L}\alpha = 0$$

$$P(r) = r^2 + \frac{g}{L} = 0 \qquad r = \pm\sqrt{-\frac{g}{L}} = \pm i\sqrt{g/L}$$

$$\alpha(t) = A\cos\left(\sqrt{g/L}\,t\right) + B\sin\left(\sqrt{g/L}\,t\right)$$

$$\alpha'(t) = -\sqrt{g/L}\,A\sin\left(\sqrt{g/L}\,t\right) + \sqrt{g/L}\,B\cos\left(\sqrt{g/L}\,t\right) =$$

$$= \sqrt{g/L}\left(-A\sin\left(\sqrt{g/L}\,t\right) + B\cos\left(\sqrt{g/L}\,t\right)\right)$$

$$\alpha'(0) = \sqrt{g/L}\,(-A\sin 0 + B\cos 0) = 0 \iff$$

$\sin 0 = 0 \qquad \cos 0 = 1$

$$\iff \sqrt{g/L}\,B = 0 \iff \boxed{B = 0}$$

$$\alpha(t) = A\cos\left(\sqrt{g/L}\,t\right)$$

$$\alpha(0) = A\cos 0 = \pi/60 \iff \boxed{A = \pi/60}$$

$$\alpha(1) = \frac{\pi}{60}\cos\sqrt{g/L}$$

Sv.: $\alpha(1) = \frac{\pi}{60}\cos\sqrt{\frac{9{,}82}{0{,}2}} = \frac{\pi}{60}\cos\sqrt{49{,}1} \approx \frac{\pi}{60}\cos 7$