University Physics 1A

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Pendulum Lab

For a large physical pendulum:

$$-Lmg\sin\theta = I\frac{\mathrm{d}^2\theta}{\mathrm{d}t^2}$$

For small angles θ in radians, we can approximate this to:

$$\sin\theta \approx \theta$$

$$-Lmg\theta = I\frac{\mathrm{d}^2\theta}{\mathrm{d}t^2}$$

We know that:

$$\begin{aligned}
\theta &= A\cos(\omega t + \phi) \\
\frac{\mathrm{d}\theta}{\mathrm{d}t} &= -A\omega\sin(\omega t + \phi) \\
\frac{\mathrm{d}^2\theta}{\mathrm{d}t^2} &= -A\omega^2\cos(\omega t + \phi) \\
&= -\omega^2\theta \\
-Lmg\theta &= I(-\omega^2\theta) \\
\omega &= \sqrt{\frac{Lmg}{I}}
\end{aligned}$$

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech