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Analysis of the Large Amplitude Pendulum and the Effects of Damping

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Poster Presentation P14

ANALYSIS OF THE LARGE AMPLITUDE PENDULUM AND THE EFFECTS OF DAMPING

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We set out to study how a real pendulum oscillates about its equilibrium. Unlike the idealized pendulum, the period of oscillation is dependent upon the angle from which the pendulum is released and damps (decreases) with each oscillation. We found both period and damping to be dependent upon the angle from which the pendulum is released. In our case, the condition is accurately represented by Bernoulli's equation to the fourth order $T = 2\pi\sqrt{\frac{L}{g}}\left(1+\frac{1}{4}\sin^2\left(\frac{\theta}{2}\right)+\frac{9}{64}\sin^4\left(\frac{\theta}{2}\right)\right)$, where L is the length to the center of mass and θ is the angle of release as measured from the perpendicular. Due to the variance in non-conservative forces, there is no explicit equation to apply to damping because all damping equations rely on measured constants. However, the extent of damping increased as θ increased, and we were able to depict damping for our particular pendulum.