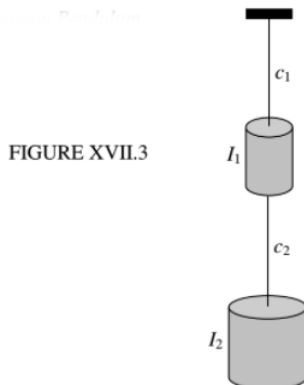


17.4: Double Torsion Pendulum

Here we have two cylinders of rotational inertias I_1 and I_2 hanging from two wires of torsion constants c_1 and c_2 .



At any instant, the top cylinder is turned through an angle θ_1 from the equilibrium position and the lower cylinder by an angle θ_2 from the equilibrium position (so that, relative to the upper cylinder, it is turned by $\theta_2 - \theta_1$). The equations and the description of the motion are just the same as in the previous example, except that $x_1, x_2, m_1, m_2, k_1, k_2$ are replaced by $\theta_1, \theta_2, I_1, I_2, c_1, c_2$. The kinetic and potential energies are

$$T = \frac{1}{2} I_1 \dot{\theta}_1^2 + \frac{1}{2} I_2 \dot{\theta}_2^2, \quad (17.4.1)$$

$$T = \frac{1}{2} c_1 \theta_1^2 + \frac{1}{2} c_2 (\theta_2 - \theta_1)^2. \quad (17.4.2)$$

The equations for ω and the displacement ratios are just the same, and there is an in-phase and an out-of-phase mode.

This page titled [17.4: Double Torsion Pendulum](#) is shared under a [CC BY-NC 4.0](#) license and was authored, remixed, and/or curated by [Jeremy Tatum](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.