

PHYS-3202 Homework 9 Due 22 Nov 2023

This homework is due to <https://uwcloud.uwinnipeg.ca/s/H4t44ogzdTkskyD> by 10:59PM on the due date. Your file(s) must be in PDF format; they may be black-and-white scans or photographs of hardcopies (all converted to PDF), PDF prepared by LaTeX, or PDF prepared with a word processor *using an equation editor*.

1. **Kater's reversible pendulum** based on a problem from Thornton & Marion and others

Consider an object hung from a pivot a distance L from the center of mass, which is a physical pendulum with frequency $\omega = \sqrt{MgL/I}$, where I is the moment of inertia around the pivot, as we've seen. Suppose we can flip the pendulum over and hang it from a pivot a distance L' on the other side of the center of mass (with a parallel axis of rotation and corresponding moment of inertia I'). If the pendulum has the same frequency of oscillation around this second pivot, show that $MLL' = I_{CM}$, the moment of inertia for the parallel axis through the center of mass. *Hint:* use the parallel axis theorem to relate I_{CM} to both I and I' .