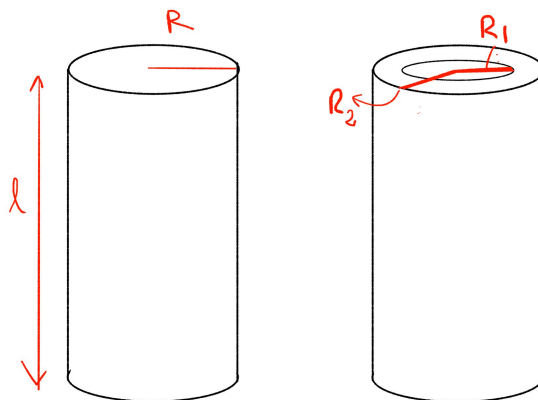# PHY 250: Homework 2

Fall 2020

Death-line: October 15th

Exercise 1

Calculate the Ineria Moment of (a) an uniform cylinder of radius R and mass M, (b) a hollow cylinder of radius R_1 and R_2 and mass M.

Exercise 2

Consider a thin rod of length l and mass m pivoted about one end. Calculate the moment of inertia. Find the point at which, if all the mass were concentrated, the moment of inertia about the pivot axis would be the same as the real moment pf inertia. The distance from this point to the pivot is called the **radius of gyration**.

    Hint: the longitudinal density of the rod is $\lambda = m/l$
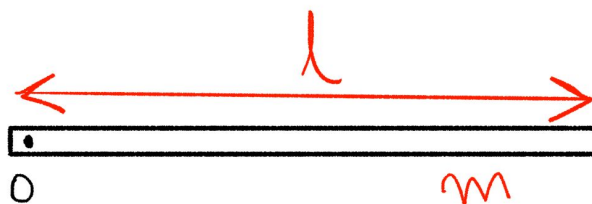
Exercise 3

A uniform bowling ball of radius R and mass M is initially launched so that it is sliding with speed V_0 without rolling on an alley with a coefficient of friction μ. How far does the ball go before it starts rolling without slipping, and what is its speed then?

Exercise 4

A uniform sphere rolls without slipping down the path shown in the figure starting from rest. (a) What is the minimum height h so that the sphere does not fall into the pit. (b) The moment of inertia of the sphere depends on its radius. Why the answer to part (a) does not depend on the radius? (c) Solve part (a) for a block that slides without friction instead of the rolling sphere. How does the minimum h in this case compare to the answer in part (a)?

    Hint: Use projectile motion to find v_1, the speed the sphere needs at the edge of the pit to make it to the other side. Use the conservation of energy to relate the initial height to the speed v_1.