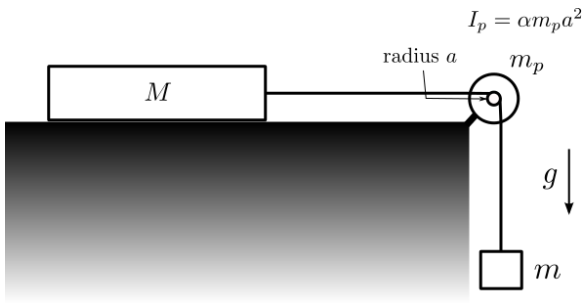
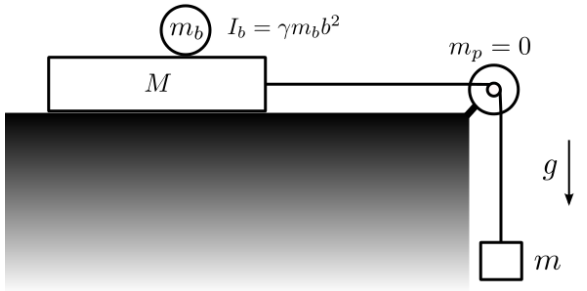
This *take-home* quiz will count as **two** quizzes.
It is due on Tuesday, December 9, but it is highly encouraged that you submit it on Monday, December 8. (I won't be in my office on Friday, Dec 5, and so cannot accept this quiz on that day.)

(a) Two masses are connected through a pulley of a *finite* mass m_p and the inner radius a (see the diagram). Mass M slides without friction. The rotational inertia of the pulley is given by $I_p = \alpha m_p a^2$, where α is a dimensionless positive constant. Assume rolling without slipping for the pulley. Find the acceleration of mass m.



(b) Here, we assume that $m_p = 0$, but there is a rolling object on top of mass M. This object has mass m_b, radius b, and rotational inertia, $I_b = \gamma m_b b^2$, where γ is a dimensionless positive constant. It rolls without slipping. Find the acceleration of mass m.



[Extra:] For more work, you may investigate and find the constraint forces as well.