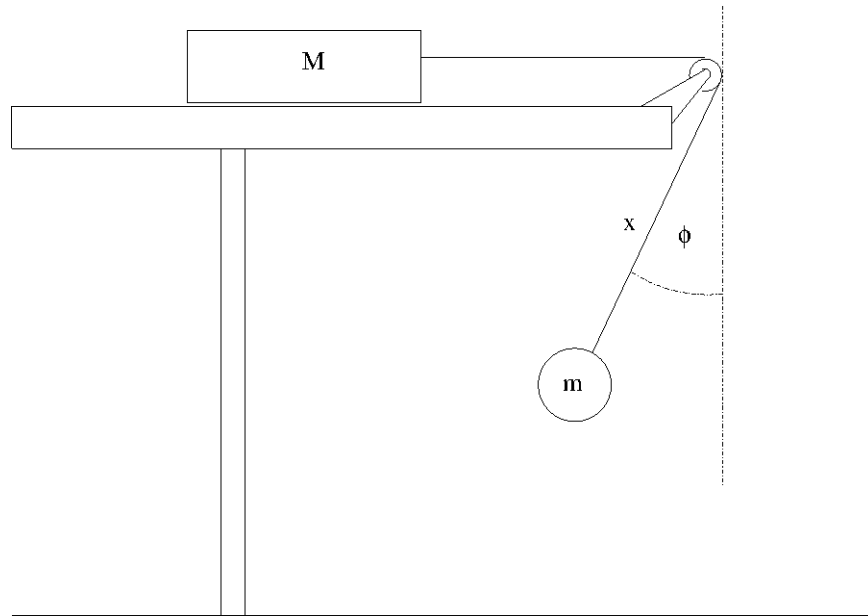


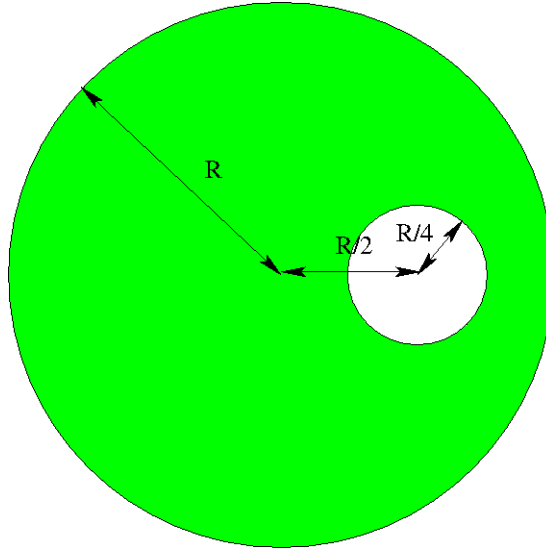
Problems

1.



The slab on the table is slipping without friction. The mass of the rope, the radius and the inertial momentum of the pulley and the size of the sphere of mass m are all negligible. Find the Lagrangian in terms of x , ϕ and their time derivatives.

2.



The sphere is uniformly charged with charge density ρ , except in the spherical hollow. Find the electric field at the centre of the hollow.

3.

A quantum particle of energy E is moving in one dimension. There is a potential $\hbar\sqrt{\frac{E}{2m}}\delta(x)$ in its way. What is the probability of transmission?

4.

Molecules of an ideal gas at absolute temperature T and chemical potential μ may be absorbed at a specific site on the wall of the container. At a given time only a single molecule can be bound there. The binding energy is $-\epsilon$. Find the probability that at a given instant of time a molecule is absorbed on the wall.