

A Problem, as slightly modified from an old Olympiad

A small block of mass m is initially at rest at the starting point $s = 0$ shown above. It slides down an increasingly rough incline, which is at an angle of θ to the horizontal. The coefficient of kinetic friction is

$$\mu = \alpha s$$

where α is a constant and s is the distance the block has traveled down the incline, as measured from its starting point. Assume that the block has enough mass to overcome static friction.

1. *With proper setup* (meaning free body diagram, coordinate system, and Newton's Laws) find the WORK done by the frictional force as a function of s .
2. How far down the plane does the block slide before coming to rest?

