Luggage Handling at airports:

A box of mass $M$ is placed on a chute in an airport luggage handling system and it has to slide down that chute to point $C$ as shown. The coefficients of static and kinetic friction between the box and the whole length of the chute are $\mu_s = 0.60$ and $\mu_k = 0.3$. Segment $AB$ is an incline at $37^\circ$ to the horizontal whereas, $BC$ is along the horizontal. *The mass of the box is unknown and it is not needed to solve the problem.* Assume acceleration due to gravity $g = 32.2 \text{ ft/s}^2$.

a. Determine whether or not the box will slide, starting from rest, from the position shown at $A$, without someone giving it a push. Substantiate your answer with a free-body diagram and appropriate calculations.

b. If its speed at the bottom (B) of the incline is 2.4 ft/s, find the length "$L$". Use *work-energy method*.

c. What is the distance "$d$" along $BC$, if it just enters the turntable at "C" with a speed 1.5 ft/s? Use *work–energy*.

d. The box enters a large turntable along the tangent of a circle of radius $R = 12 \text{ ft}$ with the same velocity as the table so that it is instantaneously at rest relative to the table. What is the *minimum coefficient of static friction* between the table and the box so that no slipping occurs?