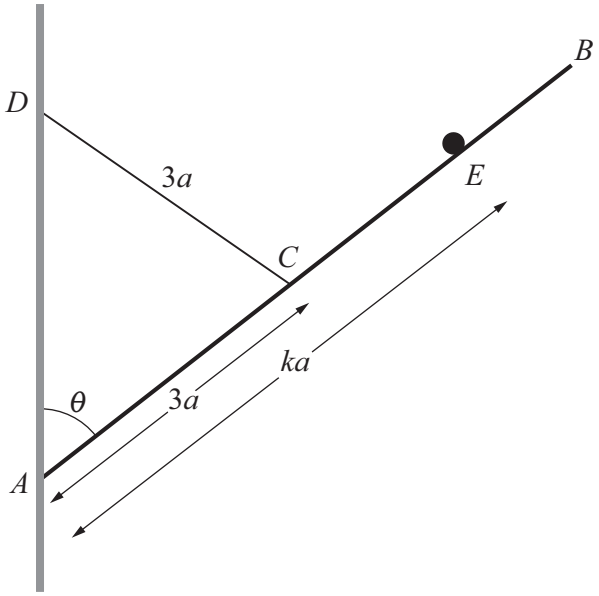
4



The end A of a uniform rod AB of length $6a$ and weight W is in contact with a rough vertical wall. One end of a light inextensible string of length $3a$ is attached to the midpoint C of the rod. The other end of the string is attached to a point D on the wall, vertically above A. The rod is in equilibrium when the angle between the rod and the wall is θ, where $\tan\theta = \frac{3}{2}$. A particle of weight W is attached to the point E on the rod, where the distance AE is equal to ka $(3 < k < 6)$ (see diagram). The rod and the string are in a vertical plane perpendicular to the wall. The coefficient of friction between the rod and the wall is $\frac{1}{3}$. The rod is about to slip down the wall.

(a) Find the value of k. [5]

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(b) Find, in terms of W, the magnitude of the frictional force between the rod and the wall. [2]