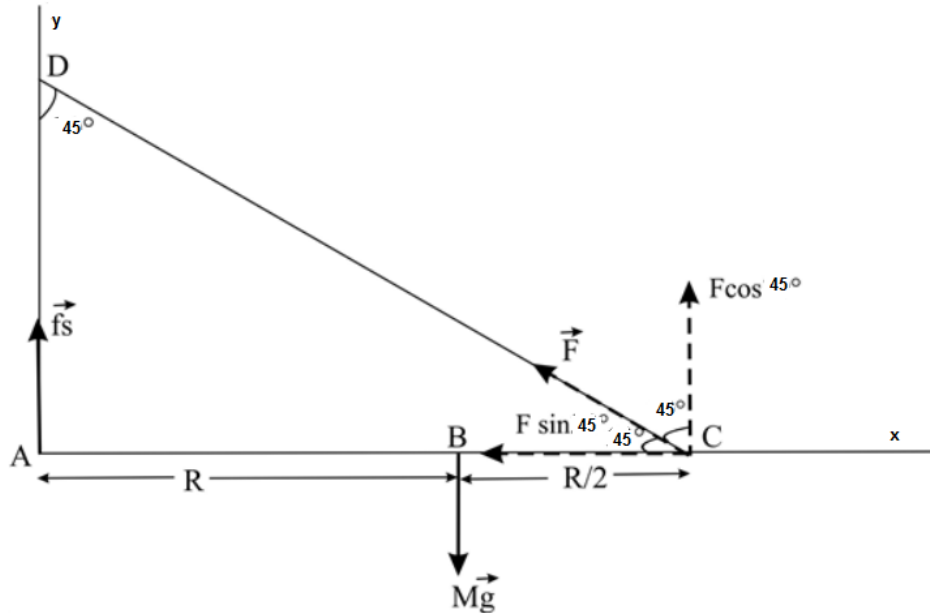


Question #80407, Physics / Classical Mechanics

A sphere of radius R is supported by a rope attached to the wall. The rope makes an angle 45° with respect to wall. The point where sphere touches wall is $3R/2$. Then find coefficient of friction

Solution



The friction force:

$$F_s = \mu N$$

For the equilibrium:

$$F \sin 45 = N,$$

$$Mg = F_s + F \cos 45$$

Taking the moments about point A, we have:

$$MgR = F \cos 45 \frac{3}{2}R$$

$$Mg = \frac{3}{2}F \cos 45$$

Thus,

$$Mg = \mu N + F \cos 45 = \mu F \sin 45 + F \cos 45 =$$

We know that

$$\sin 45 = \cos 45 = \frac{1}{\sqrt{2}}$$

So,

$$\frac{3}{2}F \cos 45 = \mu F \sin 45 + F \cos 45$$

$$\frac{3}{2}F \frac{1}{\sqrt{2}} = \mu F \frac{1}{\sqrt{2}} + F \frac{1}{\sqrt{2}}$$

$$\frac{3}{2} = \mu + 1$$

$$\mu = \frac{1}{2} = 0.5.$$

Answer: 0.5.

Answer provided by <https://www.AssignmentExpert.com>