5.

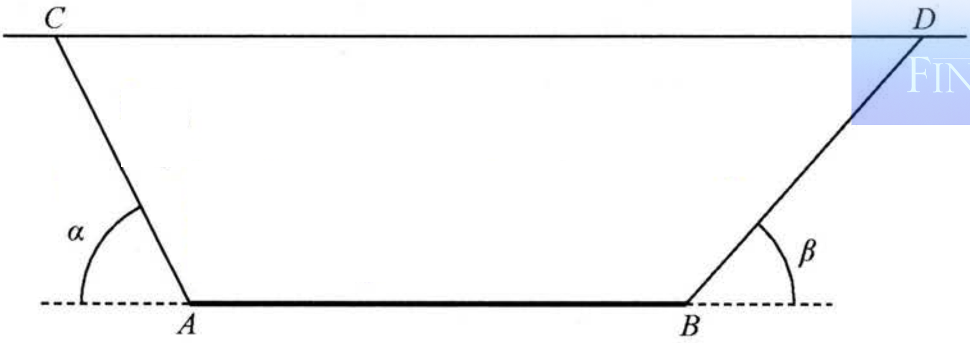

Figure 3

A non-uniform rod AB is held in equilibrium in a horizontal position by two light inextensible strings.

The first string has one end attached to the end A of the rod and the other end attached to a point C on a horizontal ceiling.

The second string has one end attached to the end B of the rod and the other end attached to a point D on the horizontal ceiling, as shown in Figure 3.

The points A, B, C and D all lie in the same vertical plane.

Given that

- the rod AB has weight W and length a
- the centre of mass of the rod is a distance $\frac{1}{3}a$ from A
- the string AC makes an angle α with the horizontal, where $\tan\alpha = \frac{4}{3}$
- the string BD makes an angle β with the horizontal

(a) show that the tension in the string AC is $\frac{5}{6}W$

(3)

The tension in the string BD is S

(b) Show that $S\sin\beta = \frac{1}{3}W$

(2)

(c) Find S in terms of W

(5)