**6.**

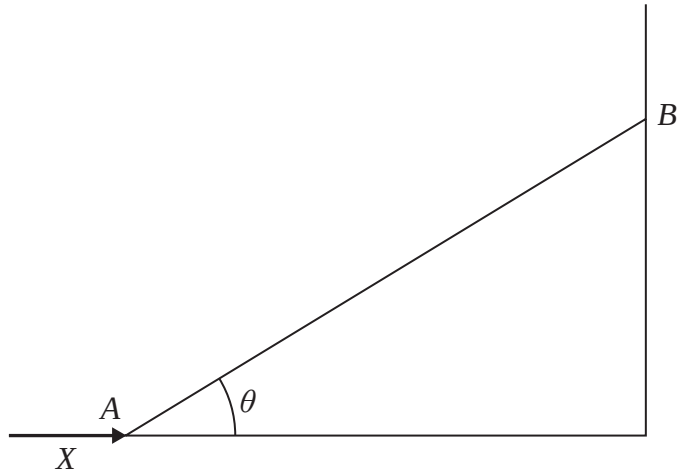


**Figure 4**

A uniform rod $AB$ has mass $M$ and length $2a$.

The rod has its end $A$ on rough horizontal ground and its end $B$ against a smooth vertical wall.

The rod lies in a vertical plane that is perpendicular to the wall.

A horizontal force of magnitude $X$ is applied to the rod at its end $A$.

The direction of this force is perpendicular to the wall and towards the wall.

The rod is at an angle $\theta$ to the ground, where $\tan\theta = \frac{3}{4}$, as shown in Figure 4.

The magnitude of the normal reaction of the ground on the rod at $A$ is $R$
The magnitude of the normal reaction of the wall on the rod at $B$ is $S$

The coefficient of friction between the rod and the ground is $\frac{4}{5}$

Given that the rod is in **limiting equilibrium** and on the point of slipping **towards** the wall,

(a) find $R$ in terms of $M$ and $g$

**(1)**

(b) show, by taking moments about $A$, that $S = \frac{2}{3}Mg$

**(3)**

(c) find $X$ in terms of $M$ and $g$.

**(4)**

The force of magnitude $X$ is now removed.

(d) (i) State the magnitude of the frictional force now acting on the rod at $A$.
Give your answer in terms of $M$ and $g$.

(ii) State the direction of the frictional force now acting on the rod at $A$.

**(2)**