3.

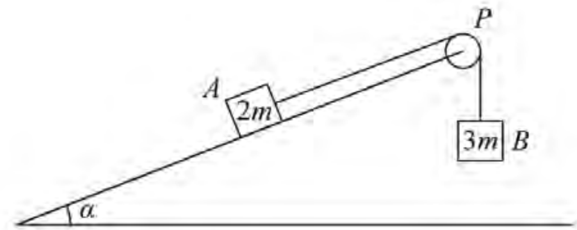

Figure 1

Two blocks, A and B, of masses $2m$ and $3m$ respectively, are attached to the ends of a light string.

Initially A is held at rest on a fixed rough plane.

The plane is inclined at angle a to the horizontal ground, where $\tan \alpha = \frac{5}{12}$.

The string passes over a small smooth pulley, P, fixed at the top of the plane.

The part of the string from A to P is parallel to a line of greatest slope of the plane. Block B hangs freely below P, as shown in Figure 1.

The coefficient of friction between A and the plane is $\frac{1}{3}$.

The blocks are released from rest with the string taut and A moves up the plane. The tension in the string immediately after the blocks are released is T. The blocks are modelled as particles and the string is modelled as being inextensible.

(*a*) Show that $T = \dfrac{132}{65}mg$

(8)

After B reaches the ground, A continues to move up the plane until it comes to rest before reaching P.

(*b*) Determine whether A will remain at rest, carefully justifying your answer.

(2)

(*c*) Suggest two refinements to the model that would make it more realistic.

(2)

(Total for Question 3 is 12 marks)