

- ① (a) A particle  $Q$  of weight  $W$  rests in limiting equilibrium on a rough plane which is inclined at an angle  $\theta$  to the horizontal.

Prove that the coefficient of friction between the particle and the plane is  $\tan \theta$ . (4 marks)

- (b) A horizontal force  $P$  is applied to  $Q$  and acts in the vertical plane containing the line of greatest slope of the inclined plane which passes through  $Q$ , and towards the plane.

If equilibrium is limiting with  $Q$  on the point of moving up the plane, find  $Q$  in terms of  $\theta$  and  $W$ .

Link to Solutions: <https://youtu.be/ubVIY9wPcy0> (9 marks)

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- ② A particle of mass 2 kg is moving down a rough plane that is inclined at an angle  $\theta$  to the horizontal, where  $\tan \theta = \frac{3}{4}$ . A force of  $T$  N acts horizontally on the particle towards the plane.

Given that the coefficient of friction is  $\frac{3}{10}$  and that the particle is moving at a constant velocity, calculate the value of  $T$ .

(7 marks)

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