4: A rough plane is inclined to the horizontal at an angle α, where $\sin\alpha = \frac{1}{7}$

A car of mass 750 kg moves up a line of greatest slope of the plane. The total resistance to the motion of the car from non-gravitational forces is 200 N. The engine of the car is working at a constant rate of 20 kW.

(a) Find the constant speed, in m s^{-1}, at which the car could move up the slope.

(4)

(b) Find the acceleration of the car at the instant when it is moving up the slope at $10\,\text{m s}^{-1}$

(4)

At this instant, the car is at the point A and the engine of the car is switched off.

The total resistance to the motion of the car from non-gravitational forces remains at 200 N.

Using the work-energy principle,

(c) find how far up the slope from A the car would travel before coming to rest.

(4)

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Question 4 continued

(Total for Question 4 is 12 marks)