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2. A particle P of mass 1.5 kg moves under the action of a single force **F** newtons.

At time t seconds, $t \geqslant 0$, P has velocity $\mathbf{v}\,\text{m}\,\text{s}^{-1}$, where

$$\mathbf{v} = (5t^2 - t^3)\mathbf{i} + (2t^3 - 8t)\mathbf{j}$$

(a) Find **F** when $t = 2$

(4)

At time $t = 0$, P is at the origin O.

(b) Find the position vector of P relative to O at the instant when P is moving in the direction of the vector **j**

(4)

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Question 2 continued

Q2

(Total 8 marks)