4. [*In this question* **i** *and* **j** *are perpendicular horizontal unit vectors and position vectors are given relative to a fixed point O.*]

The velocity of a particle P at time t seconds, $t > 0$, is given by

$$\left[\left(6t - 25\sqrt{t} + 14\right)\mathbf{i} + \left(8t - 30\sqrt{t} + 7\right)\mathbf{j}\right]\text{m s}^{-1}$$

(a) Find the value of t when P is at instantaneous rest.

(3)

(b) Find the value of t when the acceleration of P is perpendicular to $(2\mathbf{i} - \mathbf{j})$

(4)

When $t = 1$, P is at the point with position vector $\left(\frac{1}{3}\mathbf{i} - 7\mathbf{j}\right)$m.

(c) Find the distance OP when $t = 4$

(6)

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(Total for Question 4 is 13 marks)

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