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5. A particle  $P$  is moving in a plane with constant acceleration.  
The velocity,  $\mathbf{v} \text{ m s}^{-1}$ , of  $P$  at time  $t$  seconds is given by

$$\mathbf{v} = (7 - 5t)\mathbf{i} + (12t - 20)\mathbf{j}$$

- (a) Find the speed of  $P$  when  $t = 2$  (3)

- (b) Find, to the nearest degree, the size of the angle between the direction of motion of  $P$  and the vector  $\mathbf{j}$ , when  $t = 2$  (3)

The constant acceleration of  $P$  is  $\mathbf{a} \text{ m s}^{-2}$

- (c) Find  $\mathbf{a}$  in terms of  $\mathbf{i}$  and  $\mathbf{j}$  (3)

- (d) Find the value of  $t$  when  $P$  is moving in the direction of the vector  $(-5\mathbf{i} + 8\mathbf{j})$  (4)

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Question 5 continued

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