6. [*In this question* **i** *and* **j** *are horizontal unit vectors*.]

   A particle P of mass $2\,\text{kg}$ moves under the action of two forces, $(p\mathbf{i} + q\mathbf{j})\,\text{N}$ and $(2q\mathbf{i} + p\mathbf{j})\,\text{N}$, where p and q are constants.

   Given that the acceleration of P is $(\mathbf{i} - \mathbf{j})\,\text{m}\,\text{s}^{-2}$

   (a) find the value of p and the value of q.

   (5)

   (b) Find the size of the angle between the direction of the acceleration and the vector **j**.

   (2)

   At time $t = 0$, the velocity of P is $(3\mathbf{i} - 4\mathbf{j})\,\text{m}\,\text{s}^{-1}$

   At $t = T$ seconds, P is moving in the direction of the vector $(11\mathbf{i} - 13\mathbf{j})$.

   (c) Find the value of T.

   (5)

Question 6 continued

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Question 6 continued

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Question 6 continued