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3. A particle, Q, of mass 2 kg is moving under the action of a single force **F** newtons. At time t seconds ($t \geqslant 0$), the position vector of Q, relative to a fixed point O, is **r** metres and the velocity of Q is $\mathbf{v}\,\text{m}\,\text{s}^{-1}$ where

$$\mathbf{v} = (2t + 10)\mathbf{i} + 9t^{\frac{1}{2}}\mathbf{j}$$

Given that $\mathbf{r} = -20\mathbf{j}$ when $t = 0$, find

(a) **F** when $t = 4$

(3)

(b) **r** when $t = 4$

(3)

(c) the values of t for which Q is moving in the direction $\mathbf{i} + \mathbf{j}$.

(3)

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Q3

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