4a	Use $t = 2$ and $3t^2 + 2t = t^3 + kt$ $(12 + 4 = 8 + 2k)$	M1	Allow verification.
	$k = 4$ *	A1*	Obtain given answer from correct working. Verification requires a clear conclusion.
		2	
4b	Use of $\mathbf{a} = \frac{\mathrm{d}\mathbf{v}}{\mathrm{d}t}$	M1	Differentiate the vector **v** Majority of powers going down
	$\mathbf{a} = (6t + 2)\mathbf{i} + (3t^2 + 4)\mathbf{j}$	A1	Correct only
	Use $\lvert\mathbf{F}\rvert = m\lvert\mathbf{a}\rvert$	DM1	Correct use of Pythagoras and N2L Dependent on the preceding M1
	$\lvert\mathbf{F}\rvert = 1.5 \times \sqrt{14^2 + 16^2} = 3\sqrt{113}$	A1	Or $\frac{3}{2}\sqrt{452}$ or 32 or better (31.89….)
		4	
4c	Use of $\mathbf{r} = \int \mathbf{v}\,\mathrm{d}t$	M1	Majority of powers going up
	$\mathbf{r} = \left(t^3 + t^2(+A)\right)\mathbf{i} + \left(\frac{1}{4}t^4 + \frac{4}{2}t^2(+B)\right)\mathbf{j}$	A1	Allow without constant of integration
	Correct use of $\mathbf{r} = 3\mathbf{i} + 4\mathbf{j}$ when $t = 0$ to find r when $t = 2$	DM1	$\left(\mathbf{r} = \left(t^3 + t^2 + 3\right)\mathbf{i} + \left(\frac{1}{4}t^4 + \frac{4}{2}t^2 + 4\right)\mathbf{j}\right)$ Dependent on the preceding M1 Use of $\mathbf{r} = -3\mathbf{i} - 4\mathbf{j}$ is M0
	$\mathbf{r} = 15\mathbf{i} + 16\mathbf{j}$	A1	Correct answer only. Accept column vector
		4	
		(10)	