10	**(a)**			**M1***	**3.1b**	At least two terms differentiated correctly (but not for e.g. $\mathbf{a} = (pt-3)\mathbf{i} + \left(8 + qt^{-1}\right)\mathbf{j}$ which is just dividing each term in t by t)	
			$\mathbf{a} = (2pt-3)\mathbf{i} + 8\mathbf{j}$	**A1**	**1.1**	Allow stated as a column vector	A0 if +**c**
			$(\lvert\mathbf{F}\rvert =) m\sqrt{(2pt-3)^2 + 8^2}$ Or $\left(\lvert\mathbf{F}\rvert^2 =\right) m^2\left\{(2pt-3)^2 + 8^2\right\}$	**M1dep***	**3.3**	Correct use of $\lvert\mathbf{F}\rvert = m\lvert\mathbf{a}\rvert$ with their **a** – allow in terms of m (and with or without $t = 0.5$ substituted) – must multiply both terms by m	M0 if $m = 1$implied
			$(p-3)^2 + 64 = 100$ or $(2p-6)^2 + 16^2 = 400$	**A1**	**1.1**	A correct equation in p only eg $20 = 2\sqrt{(2p(0.5)-3)^2 + 64}$	Allow unsimplified
				M1dep*	**1.1**	Attempt to solve their 3TQ in p (see 5(b) for awarding this M mark if working shown). If no method seen this mark can be implied by either the correct value of p or both 9 and –3 seen. As this part is not DR then the correct real roots of their 3TQ (with or without working) or their negative root of their 3TQ (with or without working) can score this mark	Dependent on both previous M marks
			$p = -3$ only	**A1**	**2.2a**	Do not award this mark if $p = 9$ is also stated without being rejected	
				[6]			
10	**(b)**			**M1***	**3.1b**	At least two terms integrated correctly	
			$\mathbf{s} = \left(\frac{1}{3}pt^3 - \frac{3}{2}t^2\right)\mathbf{i} + \left(4t^2 + qt\right)\mathbf{j} + \mathbf{c}$	**A1ft**	**1.1**	Condone lack of + **c** and allow in terms of p or their value for p found/stated in **(a)**	Allow unsimplified
			$t = 0,\ \mathbf{s} = 2\mathbf{i} - 3\mathbf{j} \Rightarrow \mathbf{c} = 2\mathbf{i} - 3\mathbf{j}$	**M1dep***	**3.4**	Using correct initial conditions to find **c**	
			$\mathbf{s} = \left(-t^3 - \frac{3}{2}t^2 + 2\right)\mathbf{i} + \left(4t^2 + qt - 3\right)\mathbf{j}$	**A1**	**1.1**	cao (oe)	Accept any vector form
				[4]			

10	**(c)**		$t=1,\ \mathbf{s}=-\frac{1}{2}\mathbf{i}+(1+q)\mathbf{j}$	**M1***	**3.4**	Substitute $t = 1$ into their **s**	Dependent on first M mark in (b)
			$k\left(-\frac{1}{2}\mathbf{i}+(1+q)\mathbf{j}\right)=2\mathbf{i}-8\mathbf{j}\Rightarrow k=\ldots$	**M1dep***	**3.1b**	Correct method in an attempt to find q (e.g. equating a scalar multiple of their **s** (evaluated at $t = 1$) to $2\mathbf{i} – 3\mathbf{j}$ and solving for the scalar)	
			$k=-4\Rightarrow q=1$	**A1**	**2.2a**	www	
				[3]			