

Question	Scheme	Marks	AOs
3(a)	$7\mathbf{i} - 3\mathbf{j}$ seen or implied by Pythagoras	B1	1.1b
	Use Pythagoras: $\sqrt{7^2 + (-3)^2}$	M1	3.1a
	$\sqrt{58}$, 7.6 or better (m s ⁻¹)	A1	1.1b
		(3)	
3(b)	$t^2 - 3t + 7 = 2t^2 - 3$ OR $\frac{t^2 - 3t + 7}{2t^2 - 3} = \frac{1}{1} = 1$	M1	2.1
	$t = 2$ only	A1	1.1b
		(2)	
3(c)	Differentiate $\mathbf{v}$ wrt t to give a vector.	M1	3.1a
	$(2t - 3)\mathbf{i} + 4t\mathbf{j}$	A1	1.1b
		(2)	
3(d)	$2t - 3 = 0$	M1	3.1a
	$t = 1.5$	A1	1.1b
		(2)	

(9 marks)

Notes: Allow column vectors throughout.

3a	B1	cao
	M1	Use of Pythagoras, including the square root, on a velocity vector at $t = 0$
	A1	cao. Must come from a <u>correct</u> $\mathbf{v}$.
3b	M1	Equating $\mathbf{i}$ and $\mathbf{j}$ components of $\mathbf{v}$ or a ratio of 1:1 to obtain a quadratic in t only. If they use a constant, e.g. $t^2 - 3t + 7 = k$ and $2t^2 - 3 = k$, k must be eliminated to earn this mark. N.B. M0 (since wrong working seen) if they write down $\mathbf{i} + \mathbf{j} = (t^2 - 3t + 7)\mathbf{i} + (2t^2 - 3)\mathbf{j}$ OR $\begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} t^2 - 3t + 7 \\ 2t^2 - 3 \end{pmatrix}$ OR $t^2 - 3t + 7 = 1$ and $2t^2 - 3 = 1$

		and then $t^2 - 3t + 7 = 2t^2 - 3$
	A1	$t = 2$
		N.B. Allow M1A1 for a correct trial and error method where they obtain $\mathbf{v} = 5\mathbf{i} + 5\mathbf{j}$ when $t = 2$ but M0 if they don't get $t = 2$
3c	M1	At least one power decreasing by 1 in each component in their $\mathbf{v}$ (M0 if clearly dividing by t) Both i and j needed in their answer or a column vector Allow recovery if the i and j disappear and then reappear.
	A1	cao (must be a vector) isw e.g. if they find the magnitude or put $t = 0$ or differentiate again i's and j's do not need to be collected. N.B. Allow M1A0 for $2t - 3\mathbf{i} + 4t\mathbf{j}$
3d	M1	$2t - 3 = 0$ or (their derivative of the i -component of $\mathbf{v}$) = 0 N.B. M0 if they equate the derivative of both components of $\mathbf{v}$ to zero.
	A1	cao N.B. Correct answer, with no working, can score both marks.