

Question		Scheme	Marks	AOs
3(i)(a)		Integrate <b>a</b> wrt $t$ to obtain velocity	M1	3.4
		$\mathbf{v} = (t - 2t^2)\mathbf{i} + \left(3t - \frac{1}{3}t^3\right)\mathbf{j} (+\mathbf{C})$	A1	1.1b
		$8\mathbf{i} - \frac{28}{3}\mathbf{j} \text{ (m s}^{-1}\text{)}$	A1	1.1b
			(3)	
3(i)(b)		Equate <b>i</b> component of <b>v</b> to zero	M1	3.1a
		$t - 2t^2 + 36 = 0$	A1ft	1.1b
		$t = 4.5$ (ignore an incorrect second solution)	A1	1.1b
			(3)	
3(ii)		Differentiate <b>r</b> wrt to $t$ to obtain velocity	M1	3.4
		$\mathbf{v} = (2t - 1)\mathbf{i} + 3\mathbf{j}$	A1	1.1b
		Use magnitude to give an equation in $t$ only	M1	2.1
		$(2t - 1)^2 + 3^2 = 5^2$	A1	1.1b
		Solve problem by solving this equation for $t$	M1	3.1a
		$t = 2.5$	A1	1.1b
			(6)	
(12 marks)				
Notes: Accept column vectors throughout				
3(i)(a)	M1	At least 3 terms with powers increasing by 1 (but M0 if clearly just multiplying by $t$ )		
	A1	Correct expression		
	A1	Accept $8\mathbf{i} - 9.3\mathbf{j}$ or better. Isw if speed found.		
3(i)(b)	M1	Must have an equation in $t$ only (Must have integrated to find a velocity vector)		
	A1ft	Correct equation follow through on their <b>v</b> but must be a 3 term quadratic		
	A1	cao		
3(ii)	M1	At least 2 terms with powers decreasing by 1 (but M0 if clearly just dividing by $t$ )		
	A1	Correct expression		
	M1	Use magnitude to give an equation in $t$ only, must have differentiated to find a velocity (M0 if they use $\sqrt{x^2 - y^2}$ )		

	A1	Correct equation $\sqrt{(2t - 1)^2 + 3^2} = 5$
	M1	Solve a 3 term quadratic for $t$ which has come from differentiating and using a magnitude. This M mark can be implied by a correct answer with no working.
	A1	2.5