1		*EITHER*: State or imply non-modular inequality $(2(x-2))^2 > (3x+1)^2$, or corresponding quadratic equation, or pair of linear equations $2(x-2) = \pm(3x+1)$	**B1**
		Make reasonable solution attempt at a 3-term quadratic, or solve two linear equations for x	**M1**
		Obtain critical values $x = -5$ and $x = \frac{3}{5}$	**A1**
		State final answer $-5 < x < \frac{3}{5}$	**A1**
		OR: Obtain critical value $x = -5$ from a graphical method, or by inspection, or by solving a linear equation or inequality	**(B1**
		Obtain critical value $x = \frac{3}{5}$ similarly	**B2**
		State final answer $-5 < x < \frac{3}{5}$	**B1)**
		[Do not condone $\le$ for $<$.]	[4]
2	**(i)**	State or imply $y \ln 3 = (2-x)\ln 4$	**B1**
		State that this is of the form $ay = bx + c$ and thus a straight line, or equivalent	**B1**
		State gradient is $-\dfrac{\ln 4}{\ln 3}$, or exact equivalent	**B1**
			[3]
	(ii)	Substitute $y = 2x$ and solve for x, using a log law correctly at least once	**M1**
		Obtain answer $x = \ln 4 / \ln 6$, or exact equivalent	**A1**
			[2]
3	**(i)**	State answer $R = 3$	**B1**
		Use trig formula to find	**M1**
		Obtain $\alpha = 41.81°$ with no errors seen	**A1**
			[3]
	(ii)	Evaluate $\cos^{-1}(0.4)$ to at least 1 d.p. (66.42° to 2 d.p.)	**B1**√
		Carry out an appropriate method to find a value of x in the given range	**M1**
		Obtain answer 216.5° only	**A1**
		[Ignore answers outside the given interval.]	[3]
4	**(i)**	State $\dfrac{dx}{dt} = 1 - \sin t$	**B1**
		Use chain rule to find the derivative of y	**M1**
		Obtain $\dfrac{dy}{dt} = \dfrac{\cos t}{1 + \sin t}$, or equivalent	**A1**
		Use $\dfrac{dy}{dx} = \dfrac{dy}{dt} \div \dfrac{dx}{dt}$	**M1**
		Obtain the given answer correctly	**A1**
			[5]
	(ii)	State or imply $t = \cos^{-1}(\frac{1}{3})$	**B1**
		Obtain answers $x = 1.56$ and $x = -0.898$	**B1 + B1**
			[3]

5		Separate variables and make reasonable attempt at integration of either integral	**M1**
		Obtain term $\frac{1}{2}e^{2y}$	**B1**
		Use Pythagoras	**M1**
		Obtain terms $\tan x - x$	**A1**
		Evaluate a constant or use $x = 0$, $y = 0$ as limits in a solution containing terms $ae^{\pm 2y}$ and $b\tan x$, ($ab \neq 0$)	**M1**
		Obtain correct solution in any form, e.g. $\frac{1}{2}e^{2y} = \tan x - x + \frac{1}{2}$	**A1**
		Set $x = \frac{1}{4}\pi$ and use correct method to solve an equation of the form $e^{\pm 2y} = a$ or $e^{\pm y} = a$, where $a > 0$	**M1**
		Obtain answer $y = 0.179$	**A1**
			[8]
6	**(i)**	Use the product rule	**M1**
		Obtain correct derivative in any form	**A1**
		Equate 2-term derivative to zero and obtain the given answer correctly	**A1**
			[3]
	(ii)	Use calculations to consider the sign of a relevant expression at $p = 2$ and $p = 2.5$, or compare values of relevant expressions at $p = 2$ and $p = 2.5$	**M1**
		Complete the argument correctly with correct calculated values	**A1**
			[2]
	(iii)	Use the iterative formula correctly at least once	**M1**
		Obtain final answer 2.15	**A1**
		Show sufficient iterations to 4 d.p. to justify 2.15 to 2 d.p., or show there is a sign change in the interval (2.145,2.155)	**A1**
			[3]
7	**(i)**	State or imply $du = 2x\,dx$, or equivalent	**B1**
		Substitute for x and dx throughout	**M1**
		Reduce to the given form and justify the change in limits	**A1**
			[3]
	(ii)	Convert integrand to a sum of integrable terms and attempt integration	**M1**
		Obtain integral $\frac{1}{2}\ln u + \frac{1}{u} - \frac{1}{4u^2}$, or equivalent	**A1 + A1**
		(deduct A1 for each error or omission)	
		Substitute limits in an integral containing two terms of the form $a\ln u$ and bu^{-2}	**M1**
		Obtain answer $\frac{1}{2}\ln 2 - \frac{5}{16}$, exact simplified equivalent	**A1**
			[5]

8	(i)	State a correct equation for AB in any form, e.g. $\mathbf{r} = \mathbf{i} + \mathbf{j} + \mathbf{k} + \lambda(\mathbf{i} - \mathbf{j} + 2\mathbf{k})$, or equivalent	B1
		Equate at least two pairs of components of AB and l and solve for λ or for μ	M1
		Obtain correct answer for λ or for μ, e.g. $\lambda = -1$ or $\mu = 2$	A1
		Show that not all three equations are not satisfied and that the lines do not intersect	A1
			[4]
	(ii)	*EITHER*: Find $\overrightarrow{AP}$ (or $\overrightarrow{PA}$) for a general point P on l, e.g. $(1-\mu)\mathbf{i} + (-3+2\mu)\mathbf{j} + (-2+\mu)\mathbf{k}$	B1
		Calculate the scalar product of $\overrightarrow{AP}$ and a direction vector for l and equate to zero	M1
		Solve and obtain $\mu = \frac{3}{2}$	A1
		Carry out a method to calculate AP when $\mu = \frac{3}{2}$	M1
		Obtain the given answer $\frac{1}{\sqrt{2}}$ correctly	A1
		OR 1:Find $\overrightarrow{AP}$ (or $\overrightarrow{PA}$) for a general point P on l	(B1
		Use correct method to express AP^2 (or AP) in terms of μ	M1
		Obtain a correct expression in any form, e.g. $(1-\mu)^2 + (-3+2\mu)^2 + (-2+\mu)^2$	A1
		Carry out a complete method for finding its minimum	M1
		Obtain the given answer correctly	A1)
		OR 2:Calling (2, –2, –1) C, state $\overrightarrow{AC}$ (or $\overrightarrow{CA}$) in component form, e.g. $\mathbf{i} - 3\mathbf{j} - 2\mathbf{k}$	(B1
		Use a scalar product to find the projection of $\overrightarrow{AC}$ (or $\overrightarrow{CA}$) on l	M1
		Obtain correct answer in any form, e.g. $\frac{9}{\sqrt{6}}$	A1
		Use Pythagoras to find the perpendicular	M1
		Obtain the given answer correctly	A1)
		OR 3:State $\overrightarrow{AC}$ (or $\overrightarrow{CA}$) in component form	(B1
		Calculate vector product of $\overrightarrow{AC}$ and a direction vector for l, e.g. $(\mathbf{i} - 3\mathbf{j} - 2\mathbf{k}) \times (-\mathbf{i} + 2\mathbf{j} + \mathbf{k})$	M1
		Obtain correct answer in any form, e.g. $\mathbf{i} + \mathbf{j} - \mathbf{k}$	A1
		Divide modulus of the product by that of the direction vector	M1
		Obtain the given answer correctly	A1)
			[5]
9	(i)	*EITHER*: Multiply numerator and denominator of $\frac{u}{v}$ by 2 + i, or equivalent	M1
		Simplify the numerator to –5 +5i or denominator to 5	A1
		Obtain final answer –1 + I	A1
		OR: Obtain two equations in x and y and solve for x or for y	(M1
		Obtain $x = -1$ or $y = 1$	A1
		Obtain final answer –1 + I	A1)
			[3]
	(ii)	Obtain $u + v = 1 + 2\mathrm{i}$	B1
		In an Argand diagram show points A, B, C representing u, v and $u + v$ respectively	B1√
		State that OB and AC are parallel	B1
		State that $OB = AC$	B1
			[4]

	(iii)	Carry out an appropriate method for finding angle AOB, e.g. find $\arg(u/v)$	**M1**
		Show sufficient working to justify the given answer $\frac{3}{4}\pi$	**A1**
			[2]
10	**(i)**	State or imply the form $\dfrac{A}{x+3}+\dfrac{B}{x-1}+\dfrac{C}{(x-1)^2}$	**B1**
		Use a correct method to determine a constant	**M1**
		Obtain one of the values $A = -3$, $B = 1$, $C = 2$	**A1**
		Obtain a second value	**A1**
		Obtain the third value	**A1**
		[Mark the form $\dfrac{A}{x+3}+\dfrac{Dx+E}{(x-1)^2}$, where $A = -3$, $D = 1$, $E = 1$, B1M1A1A1A1 as above.]	[5]
	(ii)	Use a correct method to find the first two terms of the expansion of $(x+3)^{-1}$, $(1+\frac{1}{3}x)^{-1}$, $(x-1)^{-1}$, $(1-x)^{-1}$, $(x-1)^{-2}$, or $(1-x)^{-2}$	**M1**
		Obtain correct unsimplified expressions up to the term in x^2 of each partial fraction	**A1√ + A1√ + A1√**
		Obtain final answer $\frac{10}{3}x+\frac{44}{9}x^2$, or equivalent	**A1**
			[5]