1	Use law of the logarithm of a quotient	M1	
	Remove logarithms and obtain a correct equation, e.g. $e^z = \frac{y+2}{y+1}$	A1	
	Obtain answer $y = \frac{2-e^z}{e^z-1}$, or equivalent	A1	[3]
2	Use correct quotient or product rule	M1	
	Obtain correct derivative in any form	A1	
	Use Pythagoras to simplify the derivative to $\frac{1}{1+\cos x}$, or equivalent	A1	
	Justify the given statement, $-1 < \cos x < 1$ statement, or equivalent	A1	[4]
3	Use the tan *2A* formula to obtain an equation in tan θ only	M1	
	Obtain a correct horizontal equation	A1	
	Rearrange equation as a quadratic in tan θ, e.g. $3\tan^2\theta + 2\tan\theta - 1 = 0$	A1	
	Solve for θ (usual requirements for solution of quadratic)	M1	
	Obtain answer, e.g. 18.4°	A1	
	Obtain second answer, e.g. 135° , and no others in the given interval	A1	[6]
4 (i)	Commence division by $x^2 - x + 2$ and reach a partial quotient $4x^2 + kx$	M1	
	Obtain quotient $4x^2 + 4x + a - 4$ or $4x^2 + 4x + b/2$	A1	
	Equate *x* or constant term to zero and solve for *a* or *b*	M1	
	Obtain $a = 1$	A1	
	Obtain $b = -6$	A1	[5]
(ii)	Show that $x^2 - x + 2 = 0$ has no real roots	B1	
	Obtain roots $\frac{1}{2}$ and $-\frac{3}{2}$ from $4x^2 + 4x - 3 = 0$	B1	[2]
5 (i)	State equation $\frac{dy}{dx} = \frac{1}{2}xy$	B1	[1]
(ii)	Separate variables correctly and attempts to integrate one side of equation	M1	
	Obtain terms of the form $a\ln y$ and bx^2	A1	
	Use $x = 0$ and $y = 2$ to evaluate a constant, or as limits, in expression containing a ln y or bx^2	M1	
	Obtain correct solution in any form, e.g. $\ln y = \frac{1}{4}x^2 + \ln 2$	A1	
	Obtain correct expression for *y*, e.g. $y = 2e^{\frac{1}{4}x^2}$	A1	[5]
(iii)	Show correct sketch for $x \geqslant 0$. Needs through (0, 2) and rapidly increasing positive gradient.	B1	[1]

6 **(i)**	State or imply $\mathrm{d}u = \dfrac{1}{2\sqrt{x}}\mathrm{d}x$	**B1**	
	Substitute for x and dx throughout	**M1**	
	Justify the change in limits and obtain the given answer	**A1**	[3]
(ii)	Convert integrand into the form $A + \dfrac{B}{u+1}$	**M1***	
	Obtain integrand $A = 1$, $B = -2$	**A1**	
	Integrate and obtain $u - 2\ln(u+1)$	**A1**√ + **A1**√	
	Substitute limits correctly in an integral containing terms au and $b\ln(u + 1)$, where $ab \neq 0$	**DM1**	
	Obtain the given answer following full and correct working	**A1**	[6]
	[The f.t. is on A and B.]		
7 **(i)**	State modulus $2\sqrt{2}$, or equivalent	**B1**	
	State argument $-\frac{1}{3}\pi$ (or $-60°$)	**B1**	[2]
(ii) **(a)**	State answer $3\sqrt{2} + \sqrt{6}\ \mathrm{i}$	**B1**	
(b)	*EITHER:* Substitute for z and multiply numerator and denominator by conjugate of iz	**M1**	
	Simplify the numerator to $4\sqrt{3} + 4\ \mathrm{i}$ or the denominator to 8	**A1**	
	Obtain final answer $\frac{1}{2}\sqrt{3} + \frac{1}{2}\mathrm{i}$	**A1**	
	OR: Substitute for z, obtain two equations in x and y and solve for x or for y	**M1**	
	Obtain $x = \frac{1}{2}\sqrt{3}$ or $y = \frac{1}{2}$	**A1**	
	Obtain final answer $\frac{1}{2}\sqrt{3} + \frac{1}{2}\mathrm{i}$	**A1**	[4]
(iii)	Show points A and B in relatively correct positions	**B1**	
	Carry out a complete method for finding angle AOB, e.g. calculate the argument of $\dfrac{z^*}{\mathrm{i}z}$	**M1**	
	Obtain the given answer	**A1**	[3]
8 **(i)**	State or imply the form $\dfrac{A}{x+2} + \dfrac{Bx+C}{x^2+4}$	**B1**	
	Use a correct method to determine a constant	**M1**	
	Obtain one of $A = 2$, $B = 1$, $C = -1$	**A1**	
	Obtain a second value	**A1**	
	Obtain a third value	**A1**	[5]

(ii)	Use correct method to find the first two terms of the expansion of $(x+2)^{-1}$, $(1+\frac{1}{2}x)^{-1}$, $(4+x^2)^{-1}$ or $(1+\frac{1}{4}x^2)^{-1}$	M1	
	Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction	A1√ + A1√	
	Multiply out fully by $Bx + C$, where $BC \neq 0$	M1	
	Obtain final answer $\frac{3}{4}-\frac{1}{4}x+\frac{5}{16}x^2$, or equivalent	A1	[5]
	[Symbolic binomial coefficients, e.g. $\begin{pmatrix}-1\\1\end{pmatrix}$ are not sufficient for the M1. The f.t. is on A, B, C.]		
	[In the case of an attempt to expand $(3x^2+x+6)(x+2)^{-1}(x^2+4)^{-1}$, give M1A1A1 for the expansions, M1 for multiplying out fully, and A1 for the final answer.]		
9 (i)	Differentiate both equations and equate derivatives	M1*	
	Obtain equation $\cos a - a\sin a = -\frac{k}{a^2}$	A1 + A1	
	State $a\cos a = \frac{k}{a}$ and eliminate k	DM1	
	Obtain the given answer showing sufficient working	A1	[5]
(ii)	Show clearly correct use of the iterative formula at least once	M1	
	Obtain answer 1.077	A1	
	Show sufficient iterations to 5 d.p. to justify 1.077 to 3 d.p., or show there is a sign change in the interval (1.0765, 1.0775)	A1	[3]
(iii)	Use a correct method to determine k	M1	
	Obtain answer $k = 0.55$	A1	[2]
10 (i)	Express general point of l in component form e.g. $(1+2\lambda,\ 2-\lambda,\ 1+\lambda)$	B1	
	Using the correct process for the modulus form an equation in λ	M1*	
	Reduce the equation to a quadratic, e.g. $6\lambda^2+2\lambda-4=0$	A1	
	Solve for λ (usual requirements for solution of a quadratic)	DM1	
	Obtain final answers $-\mathbf{i}+3\mathbf{j}$ and $\frac{7}{3}\mathbf{i}+\frac{4}{3}\mathbf{j}+\frac{5}{3}\mathbf{k}$	A1	[5]
(ii)	Using the correct process, find the scalar product of a direction vector for l and a normal for p	M1	
	Using the correct process for the moduli, divide the scalar product by the product of the moduli and equate the result to $\frac{2}{3}$	M1	
	State a correct equation in any form, e.g. $\frac{2a-1+1}{\sqrt{(a^2+1+1)}.\sqrt{(2^2+(-1)^2+1)}}=\pm\frac{2}{3}$	A1	
	Solve for a^2	M1	
	Obtain answer $a = \pm 2$	A1	[5]