1	*EITHER*:	Attempt to solve for 2^x	M1	
		Obtain $2^x = 6/4$, or equivalent	A1	
		Use correct method for solving an equation of the form $2^x = a$, where $a > 0$	M1	
		Obtain answer $x = 0.585$	A1	
	OR:	State an appropriate iterative formula, e.g. $x_{n+1} = \ln((2^{x_n} + 6) / 5) / \ln 2$	B1	
		Use the iterative formula correctly at least once	M1	
		Obtain answer $x = 0.585$	A1	
		Show that the equation has no other root but 0.585	A1	[4]

[For the solution 0.585 with no relevant working, award B1 and a further B1 if 0.585 is shown to be the only root.]

2	Integrate by parts and reach $\pm x^2 \cos x \pm \int 2x \cos x \, dx$	M1	
	Obtain $-x^2 \cos x + \int 2x \cos x \, dx$, or equivalent	A1	
	Complete the integration, obtaining $-x^2 \cos x + 2x \sin x + 2\cos x$, or equivalent	A1	
	Substitute limits correctly, having integrated twice	M1	
	Obtain the given answer correctly	A1	[5]

3	(i)	State or imply $\sin a = 4/5$	B1	
		Use $\sin(A - B)$ formula and substitute for $\cos a$ and $\sin a$	M1	
		Obtain answer $\frac{1}{10}(4\sqrt{3} - 3)$, or exact eqivalent	A1	[3]
	(ii)	Use tan $2A$ formula and substitute for tan a, or use sin $2A$ and cos $2A$ formulae, substitute sin a and cos a, and divide	M1	
		Obtain $\tan 2a = -\frac{24}{7}$, or equivalent	A1	
		Use $\tan(A + B)$ formula with $A = 2a$, $B = a$ and substitute for tan $2a$ and tan a	M1	
		Obtain $\tan 3a = -\frac{44}{117}$	A1	[4]

4	(i)	Use correct quotient or product rule	M1	
		Obtain correct derivative in any form	A1	
		Equate derivative to zero and solve for x	M1	
		Obtain the given answer correctly	A1	[4]
	(ii)	Use the iterative formula correctly at least once	M1	
		Obtain final answer 4.49	A1	
		Show sufficient iterations to at least 4 d.p. to justify its accuracy to 2 d.p., or show that there is a sign change in the interval (4.485, 4.495)	A1	[3]

5	(i)	Substitute $x = -\frac{1}{2}$, equate to zero and obtain a correct equation, e.g. $-\frac{1}{4} + \frac{5}{4} - \frac{1}{2}a + b = 0$	B1	
		Substitute $x = -2$ and equate to 9	M1	
		Obtain a correct equation, e.g. $-16 + 20 - 2a + b = 9$	A1	
		Solve for a or for b	M1	
		Obtain $a = -4$ and $b = -3$	A1	[5]

	(ii)	Attempt division by $2x + 1$ reaching a partial quotient of $x^2 + kx$	M1	
		Obtain quadratic factor $x^2 + 2x - 3$	A1	
		Obtain factorisation $(2x+1)(x+3)(x-1)$	A1	[3]

[The M1 is earned if inspection has an unknown factor of $x^2 + ex + f$ and an equation in e and/or f, or if two coefficients with the correct moduli are stated without working.]
[If linear factors are found by the factor theorem, give B1 + B1 for $(x - 1)$ and $(x + 3)$, and then B1 for the complete factorisation.]

6	**(i)**	*EITHER*:	State or imply $\frac{1}{y}\frac{dy}{dx}$ as derivative of $\ln y$	B1	
			State correct derivative of LHS, e.g. $\ln y + \frac{x}{y}\frac{dy}{dx}$	B1	
			Differentiate RHS and obtain an expression for $\frac{dy}{dx}$	M1	
			Obtain given answer	A1	
		OR 1:	State $\ln y = \frac{2x+1}{x}$, or equivalent, and differentiate both sides	M1	
			State correct derivative of LHS, e.g. $\frac{1}{y}\frac{dy}{dx}$	B1	
			State correct derivative of RHS, e.g. $-1/x^2$	B1	
			Rearrange and obtain given answer	A1	
		OR 2:	State $y = \exp(2 + 1/x)$, or equivalent, and attempt differentiation by chain rule	M1	
			State correct derivative of RHS, e.g. $-\exp(2 + 1/x)/x^2$	B1 + B1	
			Obtain given answer	A1	[4]
			[The B marks are for the exponential term and its multiplier.]		
	(ii)		State or imply $x = -\frac{1}{2}$ when $y = 1$	B1	
			Substitute and obtain gradient of -4	B1√	
			Correctly form equation of tangent	M1	
			Obtain final answer $y + 4x + 1 = 0$, or equivalent	A1	[4]

7	**(i)**	Separate variables correctly and attempt integration of both sides	B1	
		Obtain term $\tan x$	B1	
		Obtain term $-\frac{1}{2}e^{-2t}$	B1	
		Evaluate a constant or use limits $x = 0$, $t = 0$ in a solution containing terms $a \tan x$ and be^{-2t}	M1	
		Obtain correct solution in any form, e.g. $\tan x = \frac{1}{2} - \frac{1}{2}e^{-2t}$	A1	
		Rearrange as $x = \tan^{-1}(\frac{1}{2} - \frac{1}{2}e^{-2t})$, or equivalent	A1	[6]
	(ii)	State that x approaches $\tan^{-1}(\frac{1}{2})$	B1	[1]
	(iii)	State that $1 - e^{-2t}$ increases and so does the inverse tangent, or state that $e^{-2t}\cos^2 x$ is positive	B1	[1]

8	**(i)**	*EITHER*: State a correct expression for $\lvert z\rvert$ or $\lvert z\rvert^2$, e.g. $(1+\cos 2\theta)^2+(\sin 2\theta)^2$		B1	
		Use double angle formulae throughout or Pythagoras		M1	
		Obtain given answer $2\cos\theta$ correctly		A1	
		State a correct expression for tangent of argument, e.g. $(\sin 2\theta/(1+\cos 2\theta)$		B1	
		Use double angle formulae to express it in terms of $\cos\theta$ and $\sin\theta$		M1	
		Obtain $\tan\theta$ and state that the argument is θ		A1	
		OR: Use double angle formulae to express z in terms of $\cos\theta$ and $\sin\theta$		M1	
		Obtain a correct expression, e.g. $1+\cos^2\theta-\sin^2\theta+2\mathrm{i}\sin\theta\cos\theta$		A1	
		Convert the expression to polar form		M1	
		Obtain $2\cos\theta(\cos\theta+\mathrm{i}\sin\theta)$		A1	
		State that the modulus is $2\cos\theta$		A1	
		State that the argument is θ		A1	[6]
	(ii)	Substitute for z and multiply numerator and denominator by the conjugate of z, or equivalent		M1	
		Obtain correct real denominator in any form		A1	
		Identify and obtain real part equal to $\frac{1}{2}$		A1	[3]
9	**(i)**	State or imply a correct normal vector to either plane, e.g. $3\mathbf{i}+2\mathbf{j}+4\mathbf{k}$ or $a\mathbf{i}+\mathbf{j}+\mathbf{k}$		B1	
		Equate scalar product of normals to zero and obtain an equation in a, e.g. $3a+2+4=0$		M1	
		Obtain $a=-2$		A1	[3]
	(ii)	Express general point of the line in component form, e.g. $(\lambda,\ 1+2\lambda,\ -1+2\lambda)$		B1	
		Either substitute components in the equation of p and solve for λ, or substitute components and the value of a in the equation of q and solve for λ		M1*	
		Obtain $\lambda=1$ for point A		A1	
		Obtain $\lambda=2$ for point B		A1	
		Carry out correct process for finding the length of AB		M1(dep*)	
		Obtain answer $AB=3$		A1	[6]
		[The second M mark is dependent on both values of λ being found by correct methods.]			
10	**(i)**	*EITHER*: Divide by denominator and obtain quadratic remainder		M1	
		Obtain $A=1$		A1	
		Use any relevant method to obtain B, C or D		M1	
		Obtain one correct answer		A1	
		Obtain $B=2$, $C=1$ and $D=-3$		A1	
		OR: Reduce RHS to a single fraction and equate numerators, or equivalent		M1	
		Obtain $A=1$		A1	
		Use any relevant method to obtain B, C or D		M1	
		Obtain one correct answer		A1	
		Obtain $B=2$, $C=1$ and $D=-3$		A1	[5]
		[SR: If $A=1$ stated without working give B1.]			
	(ii)	Integrate and obtain $x+2\ln x-\dfrac{1}{x}-\dfrac{3}{2}\ln(2x-1)$, or equivalent		B3√	
		(The f.t. is on A, B, C, D. Give B2√ if only one error in integration; B1√ if two.)			
		Substitute limits correctly in the complete integral		M1	
		Obtain given answer correctly following full and exact working		A1	[5]