Question	Answer	Marks
1	State or imply ordinates 1, 0.8556…, 0.6501…, 0	**B1**
	Use correct formula, or equivalent, with $h = \frac{1}{12}\pi$ and four ordinates	**M1**
	Obtain answer 0.525	**A1**
		3

Question	Answer	Marks
2	State a correct unsimplified version of the x or x^2 or x^3 term	**M1**
	State correct first two terms $1 - x$	**A1**
	Obtain the next two terms $-\frac{3}{2}x^2 - \frac{7}{2}x^3$	**A1 + A1**
		4

Question	Answer	Marks
3(i)	State correct expansion of $\cos(3x + x)$ or $\cos(3x - x)$	**B1**
	Substitute in $\frac{1}{2}(\cos 4x + \cos 2x)$	**M1**
	Obtain the given identity correctly **AG**	**A1**
		3
3(ii)	Obtain integral $\frac{1}{8}\sin 4x + \frac{1}{4}\sin 2x$	**B1**
	Substitute limits correctly	**M1**
	Obtain the given answer following full, correct and exact working **AG**	**A1**
		3

Question	Answer	Marks
4(i)	State or imply $n \ln y = \ln A + 3 \ln x$	B1
	State that the graph of $\ln y$ against $\ln x$ has an equation which is *linear* in $\ln y$ and $\ln x$, or has equation of the form $nY = \ln A + 3X$, where $Y = \ln y$ and $X = \ln x$, and is thus a straight line.	B1
		2
4(ii)	Substitute x- and y-values in $n \ln y = \ln A + 3 \ln x$ or in the given equation and solve for one of the constants	M1
	Obtain a correct constant, e.g. $n = 1.70$	A1
	Solve for a second constant	M1
	Obtain the other constant, e.g. $A = 2.90$	A1
		4

Question	Answer	Marks
5(i)	State correct derivative of x or y with respect to t	B1
	Use $\frac{dy}{dx} = \frac{dy}{dt} \div \frac{dx}{dt}$	M1
	Obtain $\frac{dy}{dx} = \frac{4\sin 2t}{2 + 2\cos 2t}$, or equivalent	A1
	Use double angle formulae throughout	M1
	Obtain the given answer correctly **AG**	A1
		5
5(ii)	State or imply $t = \tan^{-1}\left(-\frac{1}{4}\right)$	B1
	Obtain answer $x = -0.961$	B1
		2

Question	Answer	Marks
6(i)	Show sufficient working to justify the given statement **AG**	**B1**
		1
6(ii)	Separate variables correctly and attempt integration of at least one side	**B1**
	Obtain term $\frac{1}{2}x^2$	**B1**
	Obtain terms $\tan^2\theta + \tan\theta$, or $\sec^2\theta + \tan\theta$	**B1 + B1**
	Evaluate a constant, or use limits $x = 1$, $\theta = \frac{1}{4}\pi$, in a solution with two terms of the form ax^2 and $b\tan\theta$, where $ab \neq 0$	**M1**
	State correct answer in any form, e.g. $\frac{1}{2}x^2 = \tan^2\theta + \tan\theta - \frac{3}{2}$	**A1**
	Substitute $\theta = \frac{1}{3}\pi$ and obtain $x = 2.54$	**A1**
		7

Question	Answer	Marks
7(i)	Sketch a relevant graph, e.g. $y = e^{2x}$	**B1**
	Sketch a second relevant graph, e.g. $y = 6 + e^{-x}$, and justify the given statement	**B1**
		2
7(ii)	Calculate the value of a relevant expression or values of a pair of relevant expressions at $x = 0.5$ and $x = 1$	**M1**
	Complete the argument correctly with correct calculated values	**A1**
		2
7(iii)	State a suitable equation, e.g. $x = \frac{1}{3}\ln\left(1 + 6e^x\right)$	**B1**
	Rearrange this as $e^{2x} = 6 + e^{-x}$, or commence working *vice versa*	**B1**
		2

Question	Answer	Marks
7(iv)	Use the iterative formula correctly at least once	M1
	Obtain final answer 0.928	A1
	Show sufficient iterations to 5 d.p. to justify 0.928 to 3 d.p., or show there is a sign change in the interval (0.9275, 0.9285)	A1
		3

Question	Answer	Marks
8(i)	State or imply the form $\dfrac{A}{2x+1}+\dfrac{Bx+C}{x^2+9}$	B1
	Use a correct method for finding a constant	M1
	Obtain one of $A = 3$, $B = 1$ and $C = 0$	A1
	Obtain a second value	A1
	Obtain the third value	A1
		5
8(ii)	Integrate and obtain term $\frac{3}{2}\ln(2x+1)$ (FT on A value)	B1 FT
	Integrate and obtain term of the form $k\ln(x^2+9)$	M1
	Obtain term $\frac{1}{2}\ln(x^2+9)$ (FT on B value)	A1 FT
	Substitute limits correctly in an integral of the form $a\ln(2x+1)+b\ln(x^2+9)$, where $ab\neq 0$	M1
	Obtain answer ln 45 after full and correct working	A1
		5

Question	Answer	Marks
9(i)(a)	Substitute $x = 1 + 2\text{i}$ in the equation and attempt expansions of x^2 and x^3	**M1**
	Use $\text{i}^2 = -1$ correctly at least once and solve for k	**M1**
	Obtain answer $k = 15$	**A1**
		3
9(i)(b)	State answer $1 - 2\text{i}$	**B1**
	Carry out a complete method for finding a quadratic factor with zeros $1 + 2\text{i}$ and $1 - 2\text{i}$	**M1**
	Obtain $x^2 - 2x + 5$	**A1**
	Obtain root $-\frac{3}{2}$, or equivalent, *via* division or inspection	**A1**
		4
9(ii)	Show a circle with centre $1 + 2\text{i}$	**B1**
	Show a circle with radius 1	**B1**
	Carry out a complete method for calculating the least value of arg z	**M1**
	Obtain answer 0.64	**A1**
		4

Question	Answer	Marks
10(i)	Express general point of l in component form, e.g. $\mathbf{r} = (4 + \mu)\mathbf{i} + (3 + 2\mu)\mathbf{j} + (-1 - 2\mu)\mathbf{k}$, or equivalent NB: Calling the vector $\mathbf{a} + \mu\mathbf{b}$, the **B1** is earned by a correct reduction of the sum to a single vector or by expressing the substitution as a distributed sum $\mathbf{a.n} + \mu\,\mathbf{b.n}$	**B1**
	Substitute in given equation of p and solve for μ	**M1**
	Obtain final answer $2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ from $\mu = -2$	**A1**
		3

Question	Answer	Marks
10(ii)	Using the correct process, evaluate 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 find the inverse sine or cosine of the result	**M1**
	Obtain answer 10.3° (or 0.179 radians)	**A1**
		3
10(iii)	*EITHER*: State $a + 2b - 2c = 0$ or $2a - 3b - c = 0$	**(B1**
	Obtain two relevant equations and solve for one ratio, e.g. $a : b$	**M1**
	Obtain $a : b : c = 8 : 3 : 7$, or equivalent	**A1**
	Substitute a, b, c and given point and evaluate d	**M1**
	Obtain answer $8x + 3y + 7z = 5$	**A1)**
	*OR*1: Attempt to calculate vector product of relevant vectors, e.g. $(2\mathbf{i} - 3\mathbf{j} - \mathbf{k})\times(\mathbf{i} + 2\mathbf{j} - 2\mathbf{k})$	**(M1**
	Obtain two correct components of the product	**A1**
	Obtain correct product, e.g. $8\mathbf{i} + 3\mathbf{j} + 7\mathbf{k}$	**A1**
	Use the product and the given point to find d	**M1**
	Obtain answer $8x + 3y + 7z = 5$, or equivalent	**A1)**
	*OR*2: Attempt to form a 2-parameter equation with relevant vectors	**(M1**
	State a correct equation, e.g. $\mathbf{r} = 4\mathbf{j} - \mathbf{k} + \lambda(\mathbf{i} + 2\mathbf{j} - 2\mathbf{k}) + \mu(2\mathbf{i} - 3\mathbf{j} - \mathbf{k})$	**A1**
	State 3 equations in x, y, z, λ and μ	**A1**
	Eliminate λ and μ	**M1**
	State answer $8x + 3y + 7z = 5$, or equivalent	**A1)**
		5