1	**(i)**	*EITHER*: State or imply non-modular equation $(2(x-1))^2 = (3x)^2$, or pair of linear equations $2(x-1) = \pm 3x$	**B1**
		Make reasonable solution attempt at a 3-term quadratic, or solve two linear equations	**M1**
		Obtain answers $x = -2$ and $x = \frac{2}{5}$	**A1**
		OR: Obtain answer $x = -2$ by inspection or by solving a linear equation	**(B1**
		Obtain answer $x = \frac{2}{5}$ similarly	**B2)**
			[3]
	(ii)	Use correct method for solving an equation of the form $5^x = a$ or $5^{x+1} = a$, where $a > 0$	**M1**
		Obtain answer $x = -0.569$ only	**A1**
			[2]
2		Integrate by parts and reach $axe^{-2x} + b\int e^{-2x}\, dx$	**M1**
		Obtain $-\frac{1}{2}xe^{-2x} + \frac{1}{2}\int e^{-2x}\, dx$, or equivalent	**A1**
		Complete the integration correctly, obtaining $-\frac{1}{2}xe^{-2x} - \frac{1}{4}e^{-2x}$, or equivalent	**A1**
		Use limits $x = 0$ and $x = \frac{1}{2}$ correctly, having integrated twice	**M1**
		Obtain answer $\frac{1}{4} - \frac{1}{2}e^{-1}$, or exact equivalent	**A1**
			[5]
3		Correctly restate the equation in terms of sin θ and cos θ	**B1**
		Using Pythagoras obtain a horizontal equation in cos θ	**M1**
		Reduce the equation to a correct quadratic in cos θ, e.g. $3\cos^2\theta - \cos\theta - 2 = 0$	**A1**
		Solve a 3-term quadratic for cos θ	**M1**
		Obtain answer $\theta = 131.8°$ only	**A1**
			[5]
		[Ignore answers outside the given interval.]	
4		Separate variables and attempt integration of at least one side	**M1***
		Obtain term $\ln y$	**A1**
		Obtain terms $\ln x - x^2$	**A1**
		Use $x = 1$ and $y = 2$ to evaluate a constant, or as limits	**DM1***
		Obtain correct solution in any form, e.g. $\ln y = \ln x - x^2 + \ln 2 + 1$	**A1**
		Obtain correct expression for y, free of logarithms, i.e. $y = 2x\exp(1 - x^2)$	**A1**
			[6]

5		Use product rule	**M1**
		Obtain correct derivative in any form, e.g. $\cos x\cos 2x - 2\sin x\sin 2x$	**A1**
		Equate derivative to zero and use double angle formulae	**M1**
		Remove factor of $\cos x$ and reduce equation to one in a single trig function	**M1**
		Obtain $6\sin^2 x = 1$, $6\cos^2 x = 5$ or $5\tan^2 x = 1$	**A1**
		Solve and obtain $x = 0.421$	**A1**
			[6]
		[Alternative: Use double angle formula M1.Use chain rule to differentiate M1. Obtain correct derivative e.g. $\cos\theta - 6\sin^2\theta\cos\theta$ A1, then as above.]	
6	**(i)**	Make recognizable sketch of a relevant graph	**B1**
		Sketch the other relevant graph and justify the given statement	**B1**
			[2]
	(ii)	State $x = \frac{1}{2}\ln(25/x)$	**B1**
		Rearrange this in the form $5e^{-x} = \sqrt{x}$	**B1**
			[2]
	(iii)	Use the iterative formula correctly at least once	**M1**
		Obtain final answer 1.43	**A1**
		Show sufficient iterations to 4 d.p. to justify 1.43 to 2 d.p., or show there is a sign change in the interval (1.425, 1.435)	**A1**
			[3]
7	**(i)**	State or imply $6xy + 3x^2\frac{dy}{dx}$ as derivative of $3x^2y$	**B1**
		State $3y^2\frac{dy}{dx}$ as derivative of y^3	**B1**
		Equate attempted derivative of the LHS to zero and solve for $\frac{dy}{dx}$	**M1**
		Obtain the given answer	**A1**
			[4]
	(ii)	Equate numerator to zero	**M1***
		Obtain $x = 2y$, or equivalent	**A1**
		Obtain an equation in x or y	**DM1***
		Obtain the point (–2, –1)	**A1**
		State the point (0, 1.44)	**B1**
			[5]

8	(i)	State or imply the form $\frac{A}{x+1}+\frac{B}{x-3}+\frac{C}{(x-3)^2}$	B1
		Use a correct method to determine a constant	M1
		Obtain one of the values $A = 1$, $B = 3$, $C = 12$	A1
		Obtain a second value	A1
		Obtain a third value	A1
			[5]
		[Mark the form $\frac{A}{x+1}+\frac{Dx+E}{(x-3)^2}$, where $A = 1$, $D = 3$, $E = 3$, B1M1A1A1A1 as above.]	
	(ii)	Use correct method to find the first two terms of the expansion of $(x+1)^{-1}$, $(x-3)^{-1}$, $(1-\frac{1}{3}x)^{-1}$, $(x-3)^{-2}$, or $(1-\frac{1}{3}x)^{-2}$	M1
		Obtain correct unsimplified expansions up to the term in x^2 of each partial fraction	A1√ + A1√ + A1√
		Obtain final answer $\frac{4}{3}-\frac{4}{9}x+\frac{4}{3}x^2$, or equivalent	A1
			[5]

9	**(i)**	*EITHER*: Obtain a vector parallel to the plane, e.g. $\overrightarrow{AB} = \mathbf{i} - 2\mathbf{j} - 3\mathbf{k}$	**B1**
		Use scalar product to obtain an equation in *a*, *b*, *c* e.g. $a - 2b - 3c = 0$, $a + b - c = 0$, or $3b + 2c = 0$	**M1**
		State two correct equations	**A1**
		Solve to obtain ratio $a : b : c$	**M1**
		Obtain $a : b : c = 5 : -2 : 3$	**A1**
		Obtain equation $5x - 2y + 3z = 5$, or equivalent	**A1**
		*OR*1: Substitute for two points, e.g. *A* and *B*, and obtain $a + 3b + 2c = d$ and $2a + b - c = d$	**(B1**
		Substitute for another point, e.g. *C*, to obtain a third equation and eliminate one unknown entirely from all three equations	**M1**
		Obtain two correct equations in three unknowns, e.g. in *a*, *b*, *c*	**A1**
		Solve to obtain their ratio	**M1**
		Obtain $a : b : c = 5 : -2 : 3$, $a : c : d = 5 : 3 : 5$, $a : b : d = 5 : -2 : 5$, or $b : c : d = -2 : 3 : 5$	**A1**
		Obtain equation $5x - 2y + 3z = 5$, or equivalent	**A1)**
		*OR*2: Obtain a vector parallel to the plane, e.g. $\overrightarrow{AC} = \mathbf{i} + \mathbf{j} - \mathbf{k}$	**(B1**
		Obtain a second such vector and calculate their vector product, e.g. $(\mathbf{i} - 2\mathbf{j} - 3\mathbf{k}) \times (\mathbf{i} + \mathbf{j} - \mathbf{k})$	**M1**
		Obtain two correct components of the product	**A1**
		Obtain correct answer e.g. $5\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$	**A1**
		Substitute in $5x - 2y + 3z = d$ to find *d*	**M1**
		Obtain equation $5x - 2y + 3z = 5$, or equivalent	**A1)**
		*OR*3: Obtain a vector parallel to the plane, e.g. $\overrightarrow{BC} = 3\mathbf{j} + 2\mathbf{k}$	**(B1**
		Obtain a second such vector and form correctly a 2-parameter equation for the plane	**M1**
		Obtain a correct equation, e.g. $\mathbf{r} = \mathbf{i} + 3\mathbf{j} + 2\mathbf{k} + \lambda(\mathbf{i} - 2\mathbf{j} - 3\mathbf{k}) + \mu(3\mathbf{j} + 2\mathbf{k})$	**A1**
		State three correct equations in x, y, z, λ, μ	**A1**
		Eliminate λ and μ	**M1**
		Obtain equation $3x - 2y + 3z = 5$, or equivalent	**A1)**
			[6]
	(ii)	Correctly form an equation for the line through *D* parallel to *OA*	**M1**
		Obtain a correct equation e.g. $\mathbf{r} = -3\mathbf{i} + \mathbf{j} + 2\mathbf{k} + \lambda(\mathbf{i} + 3\mathbf{j} + 2\mathbf{k})$	**A1**
		Substitute components in the equation of the plane and solve for λ	**M1**
		Obtain $\lambda = 2$ and position vector $-\mathbf{i} + 7\mathbf{j} + 6\mathbf{k}$ for *P*	**A1**
		Obtain the given answer correctly	**A1**
			[5]
10	**(a)**	Square $x + \mathrm{i}y$ and equate real and imaginary parts to 7 and $-6\sqrt{2}$ respectively	**M1**
		Obtain equations $x^2 - y^2 = 7$ and $2xy = -6\sqrt{2}$	**A1**
		Eliminate one variable and find an equation in the other	**M1**
		Obtain $x^4 - 7x^2 - 18 = 0$ or $y^4 + 7y^2 - 18 = 0$, or 3-term equivalent	**A1**
		Obtain answers $\pm(3 - \mathrm{i}\sqrt{2})$	**A1**
			[5]

(b)	**(i)**	Show point representing 1 + 2i	**B1**
		Show circle with radius 1 and centre 1 + 2i	**B1**√
		Show a half line from the point representing 1	**B1**
		Show line making the correct angle with the real axis	**B1**
			[4]
	(ii)	State or imply the relevance of the perpendicular from 1 + 2i to the line	**M1**
		Obtain answer $\sqrt{2}-1$ (or 0.414)	**A1**
			[2]