Question	Answer	Marks	Guidance
10(a)	Angle $ACO = 0.7$	B1	Don't allow AWRT 0.7 .
		1	
10(b)	$[R =]\ 1.53\,r$	B1	Allow AWRT 1.53r.
		1	
10(c)	Sector $OAB = \frac{1}{2}r^2 \times 2.8$ $\left[=1.4r^2\right]$	B1	
	Sector $CAB = \frac{1}{2}(their\ R)^2 \times 2 \times their\ 0.7$	*M1	
	$1.638\,r^2$	A1	Allow AWRT $1.64\,r^2$.
	$[2]\times\frac{1}{2}r^2\sin(\pi - 1.4)$ OR $[2]\times\frac{1}{2}r\times their R\sin 0.7$	*M1	
	$2\times 0.4927r^2$	A1	Allow AWRT $0.98\,r^2$ to $0.99\,r^2$.
	$1.4r^2 - (their\ 1.638r^2 - their\ 0.985r^2)$	DM1	
	$0.747r^2$ to $0.748r^2$	A1	
		7	

Question	Answer	Marks	Guidance
6(a)	Integrate to obtain form $k(5x-3)^{-1}$	*M1	OE
	$4(5x-3)^{-1}$	A1	Or unsimplified equivalent. Condone absence of $\ldots + c$ so far.
	Substitute $x = \frac{4}{5}$ and $y = -3$ to attempt value of c	DM1	DM0 for substituting $\left(-3, \frac{4}{5}\right)$.
	$y = 4(5x-3)^{-1} - 7$ allow f(x) *or* $f = 4(5x-3)^{-1} - 7$	A1	OE Condone $c = -7$ as the final answer providing $y =$ or $f(x) = \frac{4}{(5x-3)} + c$ OE is seen earlier. Attempts to write equation in $y = mx + c$ form scores A0. Do not ISW. Gains max 3/4.
		4	
6(b)	Carry out stretch by replacing x by $2x$ in *their* equation	M1	Award if given as the second transformation. Do not ignore sign errors.
	Carry out translation by replacing x by $x-2$ and y by $y-10$	M1	OE Award if given as the first transformation. Do not ignore sign errors.
	$y = \frac{4}{10x-23} + 3$	A1	Or similarly simplified equivalent, WWW.
		3	

Question	Answer	Marks	Guidance
10(a)	$\left\{\frac{(4x+2)^{-1}}{-1}\right\}\{\div 4\}$ or eg $\left\{\frac{1}{16}\right\}\{-(x+0.5)^{-1}\}$ or $\frac{-1}{(16x+8)}$	B1 B1	OE If more than one function of x present then B0 B0.
	$0-(-1/24)$	M1	Apply limits to an integral, ∞ must be used correctly.
	1/24	A1	Allow 0.0417 AWRT.
		4	
10(b)	$\frac{dy}{dx} = \{-2(4x+2)^{-3}\}$ $\{\times 4\}$	B1 B1	Allow unsimplified forms.
	Recognise $\frac{dy}{dx} = -1$	B1	SOI
	$their\ \frac{-8}{(4x+2)^3} = their - 1$	M1	Must be numerical. Must be some attempt to solve *their* equation and $\frac{dy}{dx} \neq 0$.
	(0, ¼)	A1 A1	Accept $x = 0$, $y = ¼$. $y = ¼$ must be from $x = 0$ not $x = -1$.
		6	

Question	Answer	Marks	Guidance
3	$\left(\frac{1}{-1\times 4}\right)a(4x-3)^{-1}+2x$	B1	OE Do not accept $(-2+1)$ as equivalent to -1.
	Apply correct limits, $x=3$ & 1, to *their* integral	*M1	*Their* integral must contain $(4x-3)^{-1}$. Condone using $x=1$ and 3.
	$\frac{-a}{36}+6-\left(\frac{-a}{4}+2\right)=12 \Rightarrow \left[\frac{8a}{36}+4=12\right]$	DM1	OE Equate *their* linear unsimplified expression in a to 12.
	$a=36$	A1	
		4	

Question	Answer	Marks	Guidance
3(a)	State $2r+r\theta=65$ and $\frac{1}{2}r^2\theta=225$	B1	
	Form a 3-term quadratic or cubic in r or θ or $r\theta$ from correct arc and sector formula	*M1	Condone sign errors.
	Solve *their* 3 term quadratic or cubic to obtain values of r or θ	DM1	Expect $2r^2-65r+450=(2r-45)(r-10)$ or $18\theta^2-97\theta+72=(9\theta-8)(2\theta-9)$.
	$r=10$ and $\theta=4.5$ ignore $r=22.5$ and $\theta=\frac{8}{9}$, do not ignore $r=0$	A1	**B1 SC** if no quadratic or cubic solution. If $r=0$ included A0 or B0 SC.
		4	
3(b)	Use correct formula for area of triangle with clear use of angle being $2\pi-$ their θ	M1	Expect 1.783 or 102.2°, *their* θ must be reflex.
	48.9	A1	AWRT, WWW or a second answer. Or greater accuracy; condone absence of units.
		2	

Question	Answer	Marks	Guidance
10(a)	$x^2+(2x-1)^2-2[=0]\rightarrow 5x^2-4x-1\,[=0]$	*M1 A1	Or $5y^2+2y-7\,[=0]$.
	$(5x+1)(x-1)[=0]$ or $(5y+7)(y-1)[=0]$	DM1	May see factors or formula or completing square.
	$x=1$, $y=1$ or (1, 1) only	A1	May be implied on the diagram.
		4	

Question	Answer	Marks	Guidance
10(b)	$(\pi)\int(2-x^2)\mathrm{d}x = (\pi)\left(2x-\frac{x^3}{3}\right)$	*M1 A1	Attempt integration of y^2, allow $\int(2-y^2)\mathrm{d}y$.
	$(\pi)\left(2\sqrt{2}-\frac{(\sqrt{2})^3}{3}\right)-\left(2-\frac{1}{3}\right))$	DM1	Apply limits 1 → √2.
	$\frac{\pi}{3}(4\sqrt{2}-5)$	A1	CAO, allow $\frac{\pi}{3}(2\sqrt{8}-5)$, must be in given form.
		4	
10(c)	Arc length = $\frac{1}{8}(2\pi\sqrt{2})$ or $\frac{\pi\sqrt{2}}{4}$ oe	B1	Must be exact.
	Perimeter = $\sqrt{2}+$ *their* arc length	B1 FT	Must be exact, do not allow inverse trig functions.
		2	

Question	Answer	Marks
10(a)	Mid-point is (–1, 7)	**B1**
	Gradient, *m*, of *AB* is 8/12 OE	**B1**
	$y-7=-\frac{12}{8}(x+1)$	**M1**
	$3x+2y=11$ **AG**	**A1**
		4
10(b)	Solve simultaneously $12x-5y=70$ and *their* $3x+2y=11$	**M1**
	$x=5,\ y=-2$	**A1**
	Attempt to find distance between *their* (5, –2) and either (–7,3) or (5, 11)	**M1**
	$(r)=\sqrt{12^2+5^2}$ or $\sqrt{13^2+0}=13$	**A1**
	Equation of circle is $(x-5)^2+(y+2)^2=169$	**A1**
		5

Question	Answer	Marks	Guidance
10(a)	Gradient of $AB=-\frac{3}{5}$, gradient of $BC=\frac{5}{3}$ or lengths of all 3 sides or vectors	**M1**	Attempting to find required gradients, sides or vectors
	$m_{ab}m_{bc}=-1$ or Pythagoras or $\overrightarrow{AB}.\overrightarrow{BC}=0$ or $\cos ABC=0$ from cosine rule	**A1**	WWW
		2	
10(b)	Centre = mid-point of $AC=(2,4)$	**B1**	
		1	

Question	Answer	Marks	Guidance
10(c)	$(x-their\ x_c)^2+(y-their\ y_c)^2\left[=r^2\right]or\ (their\ x_c-x)^2+(their\ y_c-y)^2=\left[r^2\right]$	**M1**	Use of circle equation with *their* centre
	$(x-2)^2+(y-4)^2=17$	**A1**	Accept $x^2-4x+y^2-8y+3=0$ OE
		2	
10(d)	$\left(\frac{x+3}{2},\frac{y+0}{2}\right)=(2,4)$ or $\mathbf{BE}=2\mathbf{BD}=2\begin{pmatrix}-1\\4\end{pmatrix}$ Or Equation of *BE* is $y=-4(x-3)$ or $y-4=-4(x-2)$ leading to $y=-4x+12$ Substitute equation of *BE* into circle and form a 3-term quadratic.	**M1**	Use of mid-point formula, vectors, steps on a diagram May be seen to find *x* coordinate at *E*
	$(x,y)=(1,8)$ or $\mathbf{OE}=\begin{pmatrix}3\\0\end{pmatrix}+\begin{pmatrix}-2\\8\end{pmatrix}=\begin{pmatrix}1\\8\end{pmatrix}$	**A1**	*E* = (1, 8) Accept without working for both marks **SC B2**
	Gradient of *BD*, $m_t=-4$ or gradient $AC=\frac{1}{4}$ = gradient of tangent	**B1**	Or gradient of *BE* = -4
	Equation of tangent is $y-8=¼(x-1)$ OE	**M1 A1**	For M1, equation through *their* E or (1, 8) (not *A*, *B* or *C*) and with gradient $\frac{-1}{their-4}$
		5	

Question	Answer	Marks	Guidance
4	$3x^2-4x+4=mx+m-1\rightarrow 3x^2-(4+m)x+(5-m)\ (=0)$	**M1**	3-term quadratic
	$b^2-4ac=(4+m)^2-4\times3\times(5-m)$	**M1**	Find b^2-4ac for *their* quadratic
	$m^2+20m-44$	**A1**	
	$(m+22)(m-2)$	**A1**	Or use of formula or completing square. This step must be seen
	$m>2$, $m<-22$	**A1**	Allow $x>2$, $x<-22$
		5	