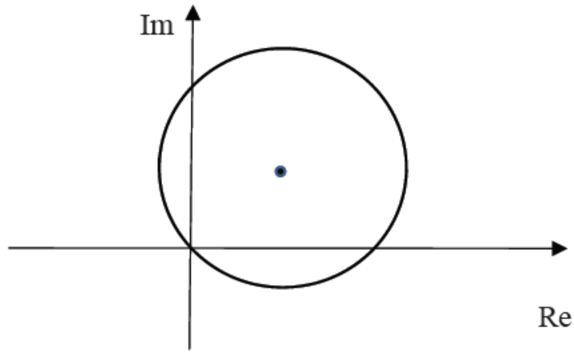
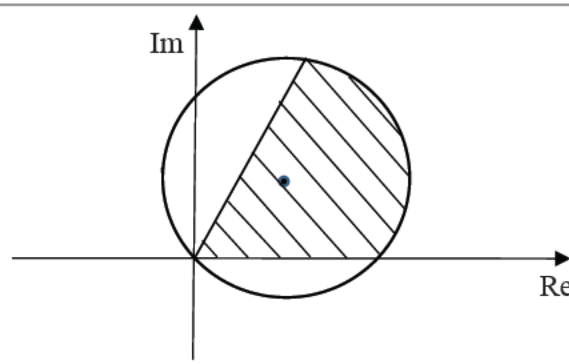
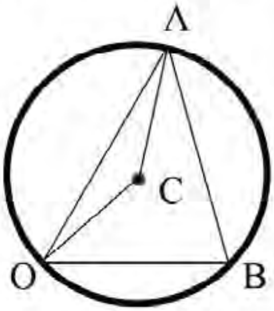
Question	Scheme	Marks	AOs
6(a)(i)		M1	1.1b
		A1	1.1b
(a)(ii)	$\lvert z-4-3\mathrm{i}\rvert=5 \Rightarrow \lvert x+\mathrm{i}y-4-3\mathrm{i}\rvert=5 \Rightarrow (x-4)^2+(y-3)^2=...$	M1	2.1
	$(x-4)^2+(y-3)^2=25$ or any correct form	A1	1.1b
	$(r\cos\theta-4)^2+(r\sin\theta-3)^2=25$ $\Rightarrow r^2\cos^2\theta-8r\cos\theta+16+r^2\sin^2\theta-6r\sin\theta+9=25$ $\Rightarrow r^2-8r\cos\theta-6r\sin\theta=0$	M1	2.1
	$\therefore r=8\cos\theta+6\sin\theta$ *	A1*	2.2a
		(6)	
(b)(i)		B1	1.1b
		B1ft	1.1b
(b)(ii)	$A=\frac{1}{2}\int r^2\,\mathrm{d}\theta=\frac{1}{2}\int(8\cos\theta+6\sin\theta)^2\,\mathrm{d}\theta$ $=\frac{1}{2}\int(64\cos^2\theta+96\sin\theta\cos\theta+36\sin^2\theta)\,\mathrm{d}\theta$	M1	3.1a
	$=\frac{1}{2}\int(32(\cos 2\theta+1)+96\sin\theta\cos\theta+18(1-\cos 2\theta))\,\mathrm{d}\theta$	M1	1.1b
	$=\frac{1}{2}\int(14\cos 2\theta+50+48\sin 2\theta)\,\mathrm{d}\theta$	A1	1.1b
	$=\frac{1}{2}\left[7\sin 2\theta+50\theta-24\cos 2\theta\right]_0^{\frac{\pi}{3}}=\frac{1}{2}\left\{\left(\frac{7\sqrt{3}}{2}+\frac{50\pi}{3}+12\right)-(-24)\right\}$	M1	2.1
	$=\frac{7\sqrt{3}}{4}+\frac{25\pi}{3}+18$	A1	1.1b
		(7)	

Question	Scheme	Marks	AOs
	(b)(ii) Alternative:  Candidates may take a geometric approach e.g. by finding sector + 2 triangles		
	Angle $ACB = \left(\frac{2\pi}{3}\right)$ so area sector $ACB = \frac{1}{2}(5)^2\frac{2\pi}{3}$ Area of triangle $OCB = \frac{1}{2}\times 8\times 3$	M1	3.1a
	Sector area ACB + triangle area $OCB = \frac{25\pi}{3}+12$	A1	1.1b
	Area of triangle OAC: Angle $ACO = 2\pi - \frac{2\pi}{3} - \cos^{-1}\left(\frac{5^2+5^2-8^2}{2\times 5\times 5}\right)$ so area $OAC = \frac{1}{2}(5)^2 \sin\left(\frac{4\pi}{3} - \cos^{-1}\left(\frac{-7}{25}\right)\right)$	M1	1.1b
	$= \frac{25}{2}\left(\sin\frac{4\pi}{3}\cos\left(\cos^{-1}\left(\frac{-7}{25}\right)\right) - \cos\frac{4\pi}{3}\sin\left(\cos^{-1}\left(\frac{-7}{25}\right)\right)\right)$ $= \frac{25}{2}\left(\left(\frac{7\sqrt{3}}{50}\right)+\frac{1}{2}\sqrt{1-\left(\frac{7}{25}\right)^2}\right) = \frac{7\sqrt{3}}{4}+6$ Total area $= \frac{25\pi}{3}+\frac{1}{2}\times 8\times 3+6+\frac{7\sqrt{3}}{4}$	M1	2.1
	$= \frac{7\sqrt{3}}{4}+\frac{25\pi}{3}+18$	A1	1.1b
			(13 marks)

Question 6 notes:

(a)(i)

M1: Draws a circle which passes through the origin

A1: Fully correct diagram

(a)(ii)

M1: Uses $z = x + \mathrm{i}y$ in the given equation and uses modulus to find equation in x and y only

A1: Correct equation in terms of x and y in any form – may be in terms of r and θ

M1: Introduces polar form, expands and uses $\cos^2\theta + \sin^2\theta = 1$ leading to a polar equation

A1*: Deduces the given equation (ignore any reference to $r = 0$ which gives a point on the curve)

(b)(i)

B1: Correct pair of rays added to their diagram

B1ft: Area between their pair of rays and inside their circle from (a) shaded, as long as there is an intersection

(b)(ii)

M1: Selects an appropriate method by linking the diagram to the polar curve in (a), evidenced by use of the polar area formula

M1: Uses double angle identities

A1: Correct integral

M1: Integrates and applies limits

A1: Correct area

(b)(ii) Alternative:

M1: Selects an appropriate method by finding angle *ACB* and area of sector *ACB* and finds area of triangle *OCB* to make progress towards finding the required area

A1: Correct combined area of sector *ACB* + triangle *OCB*

M1: Starts the process of finding the area of triangle *OAC* by calculating angle *ACO* and attempts area of triangle *OAC*

M1: Uses the addition formula to find the exact area of triangle *OAC* and employs a full correct method to find the area of the shaded region

A1: Correct area