Question Number	Scheme	Notes	Marks
4(a)	$a=8,\quad b=\frac{1}{4},\quad c=-18$	B1: Correct value for a B1: Correct value for b B1: Correct value for c	**B1** **B1** **B1**
			(3)
(b)	$\lvert w\rvert_{\min}=\sqrt{8^2+7^2}\qquad \lvert w\rvert_{\max}=\sqrt{8^2+15^2}+8$	M1: A correct method for either $\lvert w\rvert_{\min}$ or $\lvert w\rvert_{\max}$ A1: $\lvert w\rvert_{\min}=\sqrt{113}$ **and** $\lvert w\rvert_{\max}=25$	**M1** **A1**
	$\sqrt{113} \square \lvert w\rvert \square 25$	Correct region	**A1**
			(3)
(c)	$\arg w_{\min}=\arctan\frac{8}{23}=0.335$	M1: Correct method for a relevant angle. A1: awrt 0.335 only	**M1** **A1**
			(2)
			Total 8

Additional Notes:

(a)

B1B1B1: Values may be given on the diagram, but they must be clearly labelled/associated as the correct values. Do not accept e.g. 8 marked as a radius on the diagram without being associated as *a*.

Accept if the values are embedded in the relevant formula as long as they do not subsequently state incorrect values for the constants – if they state values explicitly these take precedence.

(b)

M1: For a correct method for either end of the region, they may show working on the diagram. Note for the upper limit, they may find the equation of the line through *O* and the centre of the circle, find the intersections of this line with the circle then attempt the distance for the furthest of these points from *O*.

A1: Both correct extreme values.

A1: Correct answer – must be the whole range, including |*w*|, not just state the maximum and minimum.

(c)

M1: For a correct method for either the angle directly or for another angle in a triangle on the diagram which includes the required angle or its complement. May Implied by awrt 0.33 or 0.335 or 1.2 or (degrees) awrt 19 or 71

A1: Accept anything which rounds to 0.335 and no others.