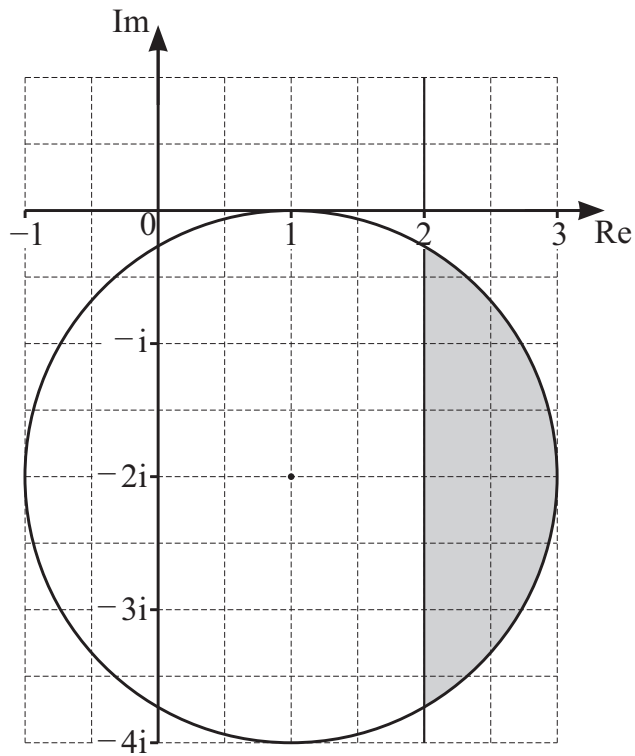


5



The shaded region on the Argand diagram shows points representing complex numbers z defined by two inequalities. The shaded region is bounded by a circle and a line parallel to the imaginary axis. The boundaries of the region are included in the shaded region.

- (a) Find two inequalities in terms of z that define the shaded region. [3]

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- (b) Calculate the least value of $\arg z$ for points in this region. [3]

This image shows a blank sheet of white paper designed for handwriting practice. It features ten horizontal dashed lines spaced evenly down the page. At the bottom center, there is a small circle containing the number "1". The rest of the page is empty, providing space for writing practice.

- 6 Solve the quadratic equation $(2+i)w^2 + 4w + 2-i = 0$. Give your answers in the form $x+iy$, where x and y are real. [5]

[illegible]

- 3

Find the complex numbers z for which $\frac{z+5i}{z-5}$ is real and $|z| = \sqrt{17}$. Give your answers in the form $z = x + iy$, where x and y are real. [6]

[6]

[illegible]

6 It is given that $z_1 = 3e^{\frac{1}{4}\pi i}$, $z_2 = \frac{3}{2}e^{\frac{1}{6}\pi i}$ and $\omega = 2e^{\frac{1}{2}\pi i}$.

(a) State the values of ωz_1 and ωz_2 . Give your answers in the form $re^{i\theta}$, where $r > 0$ and $-\pi < \theta \leq \pi$. [2]

(b) On a sketch of an Argand diagram with origin O , show the points A , B , C and D representing the complex numbers z_1 , z_2 , ωz_1 and ωz_2 respectively. [2]

(c) State the geometric effects of multiplying z_1 and z_2 by ω . [2]

- 3** On an Argand diagram shade the region whose points represent complex numbers z which satisfy both the inequalities $|z - 3i| \leq 2$ and $\frac{1}{4}\pi \leq \arg(z - 1 - 2i) \leq \frac{3}{4}\pi$. [5]

- 5** The square roots of $-1 - 4\sqrt{5}i$ can be expressed in the Cartesian form $x + iy$, where x and y are real and exact.

By first forming a quartic equation in x or y , find the square roots of $-1 - 4\sqrt{5}i$ in exact Cartesian form. [5]

Blank lined paper for writing.