

- 3 On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 3 - i| \leq 3$ and $|z| \geq |z - 4i|$. [4]

- 2 On a sketch of an Argand diagram shade the region whose points represent complex numbers z satisfying the inequalities $|z| \leq 3$, $\operatorname{Re} z \geq -2$ and $\frac{1}{4}\pi \leq \arg z \leq \pi$. [4]

- 2 On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z + 1 - i| \leq 1$ and $\arg(z - 1) \leq \frac{3}{4}\pi$. [4]

- 2 On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z| \geq 2$ and $|z - 1 + i| \leq 1$. [4]

- 2 On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z + 2 - 3i| \leq 2$ and $\arg z \leq \frac{3}{4}\pi$. [4]

- 2 On an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 1 + 2i| \leq |z|$ and $|z - 2| \leq 1$. [5]

- 2 On an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 2i| \leq |z + 2 - i|$ and $0 \leq \arg(z + 1) \leq \frac{1}{4}\pi$. [4]



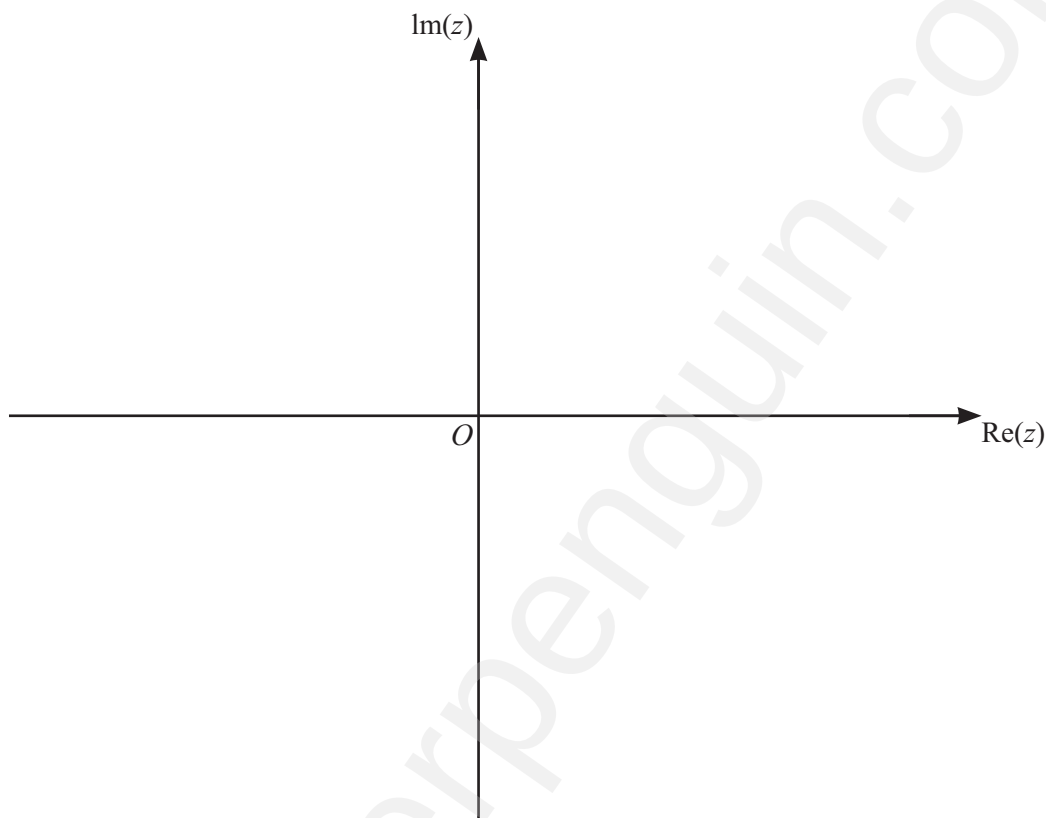
1 The complex number z satisfies $|z| = 2$ and $0 \leq \arg z \leq \frac{1}{4}\pi$.

(a) On the Argand diagram below, sketch the locus of the points representing z .

[2]

(b) On the **same diagram**, sketch the locus of the points representing z^2 .

[2]



- 3 (a) On an Argand diagram, sketch the locus of points representing complex numbers z satisfying $|z + 3 - 2i| = 2$. [2]

- (b) Find the least value of $|z|$ for points on this locus, giving your answer in an exact form. [2]

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- (b) Find the greatest value of $\arg z$ for points in this region. [2]

[illegible]

- 9 (a)** The complex numbers u and w are such that

$$u - w = 2i \quad \text{and} \quad uw = 6.$$

Find u and w , giving your answers in the form $x + iy$, where x and y are real and exact. [5]

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- (b) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities

$$|z - 2 - 2i| \leq 2, \quad 0 \leq \arg z \leq \frac{1}{4}\pi \quad \text{and} \quad \operatorname{Re} z \leq 3. \quad [5]$$

- 5 (a) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 3 - 2i| \leq 1$ and $\text{Im } z \geq 2$. [4]

- (b) Find the greatest value of $\arg z$ for points in the shaded region, giving your answer in degrees. [3]

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- 4 (a) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 4 - 3i| \leq 2$ and $\operatorname{Re} z \leq 3$. [4]

- (b) Find the greatest value of $\arg z$ for points in this region. [2]

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- 2 (a) On an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $-\frac{1}{3}\pi \leq \arg(z - 1 - 2i) \leq \frac{1}{3}\pi$ and $\operatorname{Re} z \leq 3$. [3]

- (b) Calculate the least value of $\arg z$ for points in the region from (a). Give your answer in radians correct to 3 decimal places. [2]

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- 8** (a) Solve the equation $(1 + 2i)w + iw^* = 3 + 5i$. Give your answer in the form $x + iy$, where x and y are real. [4]

[illegible]

- (b) (i) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 2 - 2i| \leq 1$ and $\arg(z - 4i) \geq -\frac{1}{4}\pi$. [4]

- (ii) Find the least value of $\text{Im } z$ for points in this region, giving your answer in an exact form. [2]

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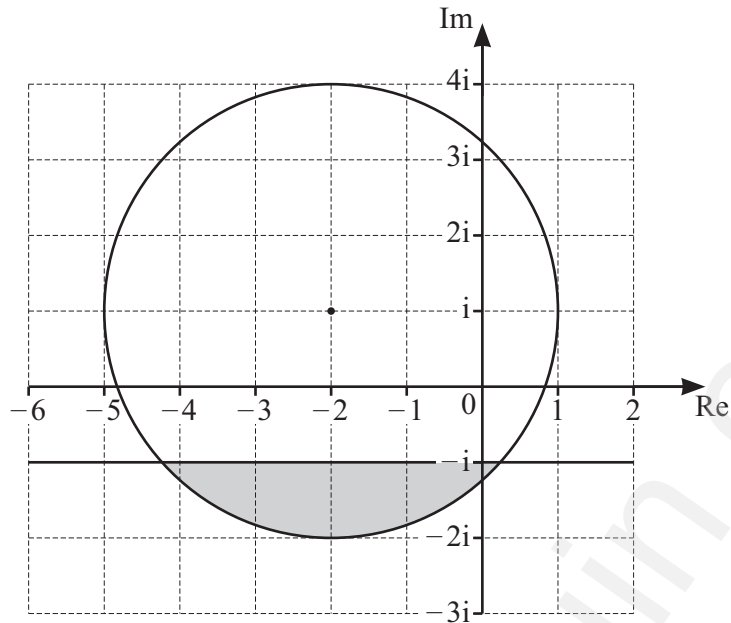
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The shaded region on the Argand diagram shows points representing complex numbers z defined by two inequalities. The shaded region is bounded by a circle and a line parallel to the real axis. The boundaries of the region are included in the shaded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

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

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- (b) Find the greatest value of $|z|$ for points in this region. [3]

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- 5 (a) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z + 2| \leq 2$ and $\text{Im } z \geq 1$. [4]

- (b) Find the greatest value of $\arg z$ for points in the shaded region. [2]

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- (b) Calculate the greatest value of $\arg z$ for points in this region. [2]

[illegible]

- (b)** Hence find the least value of $|z - w|$ for points on these loci. Give your answer in an exact form. [2]

This image shows a blank sheet of white paper with horizontal dotted lines, similar to notebook paper. A faint, light gray watermark with the word "pastpaper" is oriented diagonally from the bottom-left towards the top-right. The watermark is semi-transparent and does not obscure the underlying lines or other features of the page. There are no other markings, text, or illustrations present.

- 10** The complex number $1 + 2i$ is denoted by u . The polynomial $2x^3 + ax^2 + 4x + b$, where a and b are real constants, is denoted by $p(x)$. It is given that u is a root of the equation $p(x) = 0$.

(a) Find the values of a and b .

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(b) State a second complex root of this equation.

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- (c) Find the real factors of $p(x)$.

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- (d) (i) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - u| \leq \sqrt{5}$ and $\arg z \leq \frac{1}{4}\pi$. [4]

- (ii) Find the least value of $\text{Im } z$ for points in the shaded region. Give your answer in an exact form. [1]

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10 (a) The complex number u is defined by $u = \frac{3i}{a + 2i}$, where a is real.

(i) Express u in the Cartesian form $x + iy$, where x and y are in terms of a . [3]

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(ii) Find the exact value of a for which $\arg u^* = \frac{1}{3}\pi$. [3]

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- (b) (i) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 2i| \leq |z - 1 - i|$ and $|z - 2 - i| \leq 2$. [4]

- (ii) Calculate the least value of $\arg z$ for points in this region. [2]

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Solve the equations for v and w , giving your answers in the form $x + iy$, where x and y are real.

[6]

- (b) (i) On an Argand diagram, sketch the locus of points representing complex numbers z satisfying $|z - 2 - 3i| = 1$. [2]

- (ii) Calculate the least value of $\arg z$ for points on this locus. [2]

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11 The complex number $-\sqrt{3} + i$ is denoted by u .

- (a) Express u in the form $re^{i\theta}$, where $r > 0$ and $-\pi < \theta \leq \pi$, giving the exact values of r and θ . [2]

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- (b) Hence show that u^6 is real and state its value. [2]

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- (c) (i) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $0 \leq \arg(z - u) \leq \frac{1}{4}\pi$ and $\operatorname{Re} z \leq 2$. [4]

- (ii) Find the greatest value of $|z|$ for points in the shaded region. Give your answer correct to 3 significant figures. [2]

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- 10** The complex number $-1 + \sqrt{7}i$ is denoted by u . It is given that u is a root of the equation

$$2x^3 + 3x^2 + 14x + k = 0,$$

where k is a real constant.

- (a)** Find the value of k .

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- (b)** Find the other two roots of the equation.

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- (c) On an Argand diagram, sketch the locus of points representing complex numbers z satisfying the equation $|z - u| = 2$. [2]

- (d) Determine the greatest value of $\arg z$ for points on this locus, giving your answer in radians. [2]

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This image shows a blank sheet of white paper designed for handwriting practice. It features ten evenly spaced horizontal dashed lines across its entire width. A large, light gray watermark with the text "angulin.com" is oriented diagonally from the bottom-left towards the top-right, spanning most of the page. The watermark is semi-transparent, allowing the ruled lines to remain visible beneath it. There are no margins, text, or other markings on the page.

[illegible]



- (c) On a single Argand diagram, sketch the loci given by the equations $\operatorname{Re}(z) = 1$ and $\left|z - \frac{1}{2}\right| = \frac{1}{2}$, where z is a complex number. [3]

- (d) The complex number z is such that $\operatorname{Re}(z) = 1$. Use your answer to part (b) to give a geometrical description of the locus of $\frac{1}{z}$. [1]

