Section 2: Loci in the complex plane

Exercise level 2

1. Draw an Argand diagram showing the set of points z for which the given condition is true.
   (i) $|z-1+\mathrm{i}|=1$
   (ii) $|z-2-3\mathrm{i}|<4$
   (iii) $1\le|z|\le 2$
   (iv) $|z-1|>|z-\mathrm{i}|$

2. Draw the loci $|z|=|z-2|$ and $|z-\mathrm{i}|=|z-1|$ on the same Argand diagram. Find the value of z that satisfies both equations.

3. Represent the loci given by the equations $|z-3|=3$ and $|z|=|z-2|$ on the same Argand diagram and obtain the complex numbers corresponding to the points of intersection of these loci.

4. Given that z is a complex number such that $|z-\mathrm{i}|=1$, find the greatest and least values of $|z+1|$.

5. Draw an Argand diagram showing the set of points z for which the following conditions are true:
   (i) $\arg(z+2)=-\frac{2\pi}{3}$
   (ii) $\arg(z+2+\mathrm{i})=\frac{\pi}{2}$
   (iii) $\frac{\pi}{3}<\arg(z-2)<\pi$

6. Find the greatest and least values of arg z if $|z+2\mathrm{i}|=1$.

7. Find a complex number z whose argument is $\frac{\pi}{4}$ and which satisfies the equation $|z+2+\mathrm{i}|=|z-4+\mathrm{i}|$.

