Section 2: Loci in the complex plane

Exercise level 1

1. For each of the following draw an Argand diagram showing the points z for which
   (i) $|z| = 3$
   (ii) $|z - 2| = 5$
   (iii) $|z - 1 - 2i| = 3$
   (iv) $|z + 1| = |z - 3|$

2. Given that $z_1 = 1 + 3i$
   (i) Sketch on an Argand diagram the locus of $|z - z_1| = 3$.
   (ii) Sketch on an Argand diagram the locus of $\arg(z - z_1) = \dfrac{\pi}{3}$.

3. Draw an Argand diagram showing the set of points z for which the following conditions are true:
   (i) $\arg z = \dfrac{\pi}{4}$
   (ii) $\arg(z - 2) = \dfrac{2\pi}{3}$
   (iii) $\dfrac{\pi}{6} \le \arg(z - i) \le \dfrac{\pi}{2}$

4. Draw an Argand diagram to show the locus of z in each of the following cases:
   (i) $|z - 4| = |z - 6|$
   (ii) $|z - 2| = |z + 4|$
   (iii) $|z - (2 + 2i)| = |z + (2 + 2i)|$
   (iv) $|z + 4 + i| = |z + 4 + 6i|$

5. On an Argand diagram shade the region representing the complex number z which satisfies the inequalities:
   $$|z - 2| \le 3 \quad \text{and} \quad 0 \le \arg z \le \dfrac{\pi}{4}$$