

Complex numbers in polar form

Recall that the polar form of complex numbers is $r(\cos \theta + i \sin \theta)$ where $r \in \mathbb{R}_+$ and $\theta \in [0, 2\pi)$.

Exercise 2.4

Transform the following complex numbers from standard to polar form:

- a. $-3 + 3i$
- b. $-4\sqrt{3} - 4i$
- c. $-5i$

Solution Exercise 2.4

- a.
$$\begin{aligned} -3 + 3i &= \sqrt{18}e^{\frac{3}{4}\pi i} \\ &= \sqrt{18} \left(\cos\left(\frac{3}{4}\pi\right) + i \sin\left(\frac{3}{4}\pi\right) \right) \end{aligned}$$
- b.
$$\begin{aligned} -4\sqrt{3} - 4i &= 8e^{\arctan_2(-4, -4\sqrt{3})} \\ &= 8 \left(\cos\left(-\frac{5}{6}\pi\right) + i \sin\left(-\frac{5}{6}\pi\right) \right) \end{aligned}$$
- c.
$$\begin{aligned} -5i &= 5e^{-\frac{1}{2}\pi} \\ &= 5 \left(\cos\left(-\frac{1}{2}\pi\right) + i \sin\left(-\frac{1}{2}\pi\right) \right) \end{aligned}$$