1. Find one value of $\arg z$.

$$z = \frac{-2}{1+\sqrt{3}i}, \quad z = \frac{i}{-2-2i}, \quad z = (\sqrt{3}-i)^6.$$

2. Using the polar form show that

$$(i-1)^7 = -8(1+i).$$

3. Find the following roots in polar coordinates and show them geometrically.

$$(2i)^{1/2}, \quad (-1)^{1/3}, \quad (-16)^{1/4}, \quad 8^{1/6}.$$

4. Use de Moivre's formula to compute $\cos 4\theta$ as a function of $\cos\theta, \sin\theta$.

5. If $z \in \mathbb{C} \setminus \{1\}$ and $n \in \mathbb{N}$ show that $1 + z + z^2 + \cdots + z^n = \frac{1-z^{n+1}}{1-z}$. Then use this to show the formula

$$1 + \cos\theta + \cos 2\theta + \cdots + \cos n\theta = \frac{1}{2} + \frac{\sin\frac{2n+1}{2}\theta}{2\sin(\theta/2)}, \quad (0 < \theta < 2\pi).$$

6. Which curve in the complex plane is described by each of the following parametrizations?

$$\begin{aligned}
z(t) &= 1 + i + \sqrt{2}e^{it}, \quad 0 \le t < 2\pi,\\
w(t) &= 1 + i + (i-1)t, \quad t \in \mathbb{R},\\
u(t) &= it - (1-t), \quad 0 \le t \le 1,\\
s(t) &= t + t^2 i, \quad t \in \mathbb{R},\\
S(t) &= it - t^2, \quad t \in \mathbb{R}.
\end{aligned}$$