1) There are some straightforward consequences to the definition of i º $\sqrt{-1}$. For example,

$$i^{-1} = \frac{1}{i} = \frac{1}{i}\left(\frac{-i}{-i}\right) = -i, \qquad i^0 = 1, \qquad i^1 = i$$

Generate all the integer powers of *i* until the pattern repeats.

2) Using the Maclaurin series expansion for $\cos q$, $\sin q$, e^q, and your results from question 1, show that

$$e^{iq} = \cos q + i \sin q$$

This is known as Euler's Formula.

3) Convert the following complex numbers to their polar form. In each case, draw an Argand diagram for *z*.

(a) $z = -3 + 5i$

(b) $z = 2 + i$

(c) $z = -6 - 5i$

4) Convert the following complex numbers to their rectangular form.

(a) $16e^{ip/8}$

(b) $4e^{-i3/4}$

5)

(a) Consider the two complex numbers $z_1 = 2e^{i2p/3}$ and $z_2 = 3e^{ip/4}$. Compute $z_1 + z_2$. Draw an Argand diagram for z_1 and z_2, and confirm your calculation graphically. Likewise, compute $z_1 - z_2$, and confirm your calculation graphically.

(b) Using $z_1 = 4e^{ip}$ and $z_2 = 3e^{i2p}$, find $z_1 z_2$.

(c) Using $z_1 = 8e^{i2p}$ and $z_2 = 3e^{ip/2}$, find z_1 / z_2.

(c) Using $z_1 = 8e^{i4}$, find z_1^2.

6) Using complex exponentials, prove the following trigonometric identities.

(a) $\sin(2\theta) = 2\sin\theta\cos\theta$

(b) $\cos(3q) = 4\cos^3(q) - 3\cos(q)$