Complex Numbers 2

1. Plot the following complex numbers in the complex plane

   (a) $2i$ (b) $-3 + 2i$ (c) $(-3+2i)^*$ (d) $\dfrac{1+i}{\sqrt{2}}$

2. Find the real and imaginary parts of the complex numbers whose moduli and arguments are

   (a) $|z| = 3.0$ $\arg\{z\} = 45^\circ$

   (b) $|z| = 7.2$ $\arg\{z\} = 2.0\,\text{rad}$

   (c) $|z| = 1.0$ $\arg\{z\} = -5\pi/2$ rad

3. Find the moduli and arguments (in degrees) of

   (a) $4 + 5i$ (b) $-2 + 7i$ (c) $-i$

4. If $z = 3 + 4i$, find the moduli and arguments (in radians) of z, iz, i^2z, i^3z, i^4z, and plot them in the complex plane.

5. Write the following numbers in exponential form

   (a) i (b) $-i$ (c) $1+i$ (d) $1-i\sqrt{3}$

6. Write the following complex numbers in the form $x + iy$

   (a) $e^{-i3\pi/4}$ (b) $e^{+i5\pi/4}$ (c) $3e^{i}$ (d) $\dfrac{1}{\sqrt{3}\,e^{i\pi/3}}$

7. *Harder ...* Given that $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$, derive identities for $\cos 3\theta$ and $\sin 3\theta$ in terms of $\cos\theta$ and $\sin\theta$.

8. If you add or subtract 360° (= 2π radians) to an angle, the meaning of the angle is the same. (This feature has in fact already appeared above; did you notice it?)

   Which sets within the following list represent the same angle in degrees? -

55	235	415	-135	-665	35
-315	-695	-305	775	1115	-335
-345	755	-1045	25	45	1135

   Which sets within the following list represent the same angle in radians? -

$-43\pi/7$	$19\pi/7$	$48\pi/7$	$5\pi/7$	$-38\pi/7$	$-15\pi/7$
$-9\pi/7$	$61\pi/7$	$57\pi/7$	$62\pi/7$	$6\pi/7$	$-39\pi/7$
$43\pi/7$	$-92\pi/7$	$33\pi/7$	$20\pi/7$	$143\pi/7$	$-4\pi/7$