

**Access to Science, Engineering and Agriculture:
Mathematics 2
MATH00040
Assignment 2**

Due Date: By 7.30pm on Wednesday 6/3/19

Show all your workings - part of overall mark

1. For each of the following pairs of complex numbers, calculate $|z|$, \bar{z} , $\operatorname{Re}(z)$, $\operatorname{Im}(z)$, $|w|$, \bar{w} , $\operatorname{Re}(w)$, $\operatorname{Im}(w)$, $z + w$, $z - w$, zw , $\frac{z}{w}$ and $\frac{w}{z}$.

(a) $z = 1 + 3i$ and $w = 2 + i$.

(b) $z = 1 - 2i$ and $w = -2 - i$.

(c) $z = 2i$ and $w = -4$.

(d) $z = 2 - 4i$ and $w = -1 + 6i$.

2. Convert the following complex numbers into polar form.

(a) $\sqrt{3} + i$

(b) $2i$

(c) $-1 + i$

(d) -3

(e) $-2 - \frac{2}{\sqrt{3}}i$

(f) $3 - 3\sqrt{3}i$

3. Using your answers to Question 2, calculate

(a) $(\sqrt{3} + i)^2$

(b) $(2i)^3$

(c) $(-1 + i)^4$

(d) $(-3)^5$

(e) $\left(-2 - \frac{2}{\sqrt{3}}i\right)^6$

(f) $(3 - 3\sqrt{3}i)^7$

In each case you should first express your answer in polar form and then use a calculator to express your answer in Cartesian form to three decimal places.

4. Again, using your answers to Question 2, calculate

- (a) All the square roots of $\sqrt{3} + i$
- (b) All the third roots of $2i$
- (c) All the fourth roots of $-1 + i$
- (d) All the fourth roots of -3
- (e) All the third roots of $-2 - \frac{2}{\sqrt{3}}i$
- (f) All the square roots of $3 - 3\sqrt{3}i$

In each case you should first express all the roots exactly in polar form and then use a calculator to express them in Cartesian form to three decimal places.