

ChE641: Mathematical Methods in Chemical Engineering

Assignment 2

Due Date: 21 September

1. Two complex numbers z and w are given by $z = 3 + 4i$ and $w = 2 - i$. On an Argand diagram, plot:
 - (a) $z + w$,
 - (b) $w - z$,
 - (c) wz ,
 - (d) z/w

2. By considering the real and imaginary parts of the product $e^{i\theta}e^{i\phi}$ prove the standard formulae for $\cos(\theta + \phi)$ and $\sin(\theta + \phi)$.

3. For each of the following complex numbers and their complex conjugates, find x , y , r , and θ and also draw a neat sketch of complex numbers and their conjugates in the Argand plane by specifying x , y , r , and θ
 - (a) $2 - 2i$,
 - (b) $4[\cos(\frac{2\pi}{3}) - i \sin(\frac{2\pi}{3})]$,
 - (c) $\sqrt{2}e^{\frac{-i\pi}{4}}$,
 - (d) $3e^{\frac{i\pi}{2}}$,

4. Find the absolute value of each of the following:
 - (a) $\frac{2i-1}{i-2}$,
 - (b) z/\bar{z} ,
 - (c) $\frac{3i}{i-\sqrt{3}}$.

5. Solve for all possible values of the real numbers x and y in the following equations:
 - (a) $x + iy = 3i - ix$,
 - (b) $(x + iy)^2 = (x - iy)^2$.

6. Express the following complex numbers in the $x + iy$ form and draw neat sketch of them in Argand plane by specifying x , y , r , and θ :

(a) $9e^{\frac{3\pi i}{2}}$,

(b) $e^{\frac{3+4\pi i}{3}}$,