Complex Numbers

Multiplication and Division - Polar Form

$z_1 = r_1[\cos\theta_1 + i\sin\theta_1]$ $z_2 = r_2[\cos\theta_2 + i\sin\theta_2]$

$$z_1 \times z_2 = r_1 \times r_2[\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]$$

To multiply complex numbers in polar form ➡ *Multiply the Modulii, Add the Arguments*

Multiplication and Division - Polar Form

$z_1 = r_1[\cos\theta_1 + i\sin\theta_1]$ $z_2 = r_2[\cos\theta_2 + i\sin\theta_2]$

$$z_1 \times z_2 = \frac{r_1}{r_2}[\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)]$$

To divide complex numbers in polar form ➡ *Divide the Modulii, Subtract the Arguments*

Example 1

$z = 8[\cos 50 + i\sin 50]$ $w = 2[\cos 30 + i\sin 30]$

$zw = 16[\cos 80 + i\sin 80]$

$\frac{z}{w} = 4[\cos 20 + i\sin 20]$

Example 2

$$z = 6\left[\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}\right] \qquad w = 2\left[\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right]$$

$$\frac{z}{w} = 3\left[\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right]$$

$$zw = 12\left[\cos\frac{7\pi}{6} + i\sin\frac{7\pi}{6}\right]$$
$$= 12\left[\cos\left(-\frac{5\pi}{6}\right) + i\sin\left(-\frac{5\pi}{6}\right)\right]$$
$$= 12\left[\cos\frac{5\pi}{6} - i\sin\frac{5\pi}{6}\right]$$