

Investigating Powers of Complex Numbers

Let z be the complex number $z = 2\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right)$ or $z = 2e^{\frac{\pi i}{5}}$
Find the different powers of z in modulus-argument and exponential forms.

Power of z	Calculation	Modulus-Argument Form	Exponential Form
z		$2\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right)$	$z = 2e^{\frac{\pi i}{5}}$
z^2	$2\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right) \times 2\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right)$		
z^3			
z^4			
z^5			
z^n			

Now, consider the general complex number $z = r(\cos\theta + i\sin\theta)$ or $z = re^{i\theta}$
Find the different powers of z in modulus-argument and exponential forms.

Power of z	Calculation	Modulus-Argument Form	Exponential Form
z		$r(\cos\theta + i\sin\theta)$	$re^{i\theta}$
z^2	$r(\cos\theta + i\sin\theta) \times r(\cos\theta + i\sin\theta)$		
z^3			
z^4			
z^5			
z^n			

We can conclude that:

$$\left(r(\cos\theta + i\sin\theta)\right)^n =$$