

Rectangular to Polar Equations

	Rectangular		Polar
Real	(x, y)	\longleftrightarrow	(r, θ)
Complex	$x + yi$	\longleftrightarrow	$r(\cos\theta + i\sin\theta)$

Conversion Equations

$$\begin{aligned}x^2 + y^2 &= r^2 \\x &= r \cos\theta \\y &= r \sin\theta \\\tan\theta &= y/x\end{aligned}$$

Multiplying

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

Dividing

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

Complex Powers (De Moivre's Theorem)

$$z^n = r^n [\cos(n\theta) + i\sin(n\theta)]$$

Complex Roots

$$\sqrt[n]{z} = \sqrt[n]{r} [\cos(\frac{\theta + 360k}{n}) + i\sin(\frac{\theta + 360k}{n})]$$

Symmetry Tests for Graphing

x-axis: replace θ with $(-\theta)$
y-axis: replace θ with $(\pi - \theta)$
origin: replace r with $(-r)$

For y-axis symmetry use:
 $\sin(\alpha - \beta) = \sin\alpha \cos\beta + \sin\beta \cos\alpha$

