COMPLEX NUMBERS: EXPONENTIAL FORM REFERENCE

$$z = r(\cos\theta + i\sin\theta) = re^{i\theta}$$

Where $r = |z| = \sqrt{(a^2 + b^2)}$ and $\theta = \arg(z)$

Rectangular (a + bi)	Polar [r, θ]	Exponential ($re^{i\theta}$)
1	[1, 0]	$1e^{i0}$
i	[1, π/2]	$1e^{i\pi/2}$
-1	[1, π]	$1e^{i\pi}$
-i	[1, 3π/2]	$1e^{i3\pi/2}$
1 + i	[√2, π/4]	$\sqrt{2}e^{i\pi/4}$
√3 + i	[2, π/6]	$2e^{i\pi/6}$

Operations

- **Multiplication:** $z_1z_2 = r_1r_2e^{i(\theta_1+\theta_2)}$
- **Division:** $z_1/z_2 = (r_1/r_2)e^{i(\theta_1-\theta_2)}$
- **Powers:** $z^n = r^ne^{in\theta}$

Key Identities

- $e^{i\pi} + 1 = 0$
- $\sin\theta = (e^{i\theta} - e^{-i\theta}) / 2i$
- $\cos\theta = (e^{i\theta} + e^{-i\theta}) / 2$