Magnet Precalculus CD
Complex Coordinates

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Chapter 1

1.1

Polar coordinates on the complex plain can be represented as a complex number. Any polar point (r, θ) can be represented as $r(\cos(\theta) + \sin(\theta))$, or $r\operatorname{cis}(\theta)$. Complex numbers are generally written as $z = ...$.

The multiplication rule says that for any two complex points, z_1 and z_2, written as $z = r(\operatorname{cis}(\theta))$, $z_1 z_2 = r_1 r_2 \operatorname{cis}(\theta_1 + \theta_2)$. Conversely, $\frac{z_1}{z_2} = \frac{r_1}{r_2}\operatorname{cis}(\theta_1 - \theta_2)$

DeMoivre's Theorem is that $z^n = (r\operatorname{cis}(\theta))^n = r^n \operatorname{cis}(n\theta)$

If a complex number z satisfies the equation $z^n = w$, we say that z is a complex n^{th} root of w. We can use DeMoivre's Theorem to find these distinct n^{th} roots. Let $w = r(\cos(\theta) + i\sin(\theta))$ be a complex number in polar form. If $w \neq 0$, w has n distinct roots given by the formula below, where $k = 0, 1, 2, 3, ..., n-1$.

$z_k = \sqrt[n]{r}\operatorname{cis}(\frac{\theta+2\pi k}{n})$