COMPLEX NUMBERS & PLANE GEOMETRY

FUNDAMENTAL FORMS

Rectangular: $z = x + iy$
Polar: $z = r(\cos \hat{I}, + i \sin \hat{I},)$
Exponential: $z = re^{i\hat{I},}$

VECTOR REPRESENTATION

Real (Re)
Imaginary (Im)

GEOMETRIC OPERATIONS

Operation	Geometric Effect
Addition (z + w)	Translation by vector w
Multiplication (z Â· $e^{i\hat{I}\pm}$)	Rotation by angle Î±
Multiplication (z Â· k)	Scaling (Dilation) by factor k
Conjugation (zÌ„)	Reflection across Real axis

DISTANCE & CIRCLES

Distance: $|z\hat{a},\square - z\hat{a},,|$
Circle eq: $|z - z\hat{a},€| = r$
Line eq: $|z - a| = |z - b|$

*Where $z\hat{a},€$ is the center and r is the radius. The line equation represents the perpendicular bisector of segment ab.

DE MOIVRE'S THEOREM

$z^n = r^n [\cos(n\hat{I},) + i \sin(n\hat{I},)]$

ROOTS OF UNITY

$Ï‰_k = e^{i(2Ï€k/n)}$
for $k = 0, 1, ..., n-1$

Reference Material â€¢ Complex Analysis & Euclidean Geometry Integration