Complex Numbers – Useful formulas and Identities
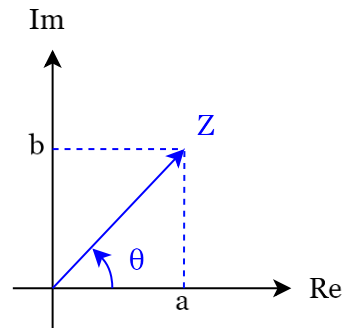
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Definitions

$$z = a + jb = \sqrt{a^2 + b^2}\, e^{j\theta}$$

$$z^* = a - jb = \sqrt{a^2 + b^2}\, e^{-j\theta}$$

$$\theta = \tan^{-1}\left(\frac{|b|}{|a|}\right)$$

Complex conjugate rules

$$z + z^* = 2 \cdot \mathrm{Re}(z)$$

$$z - z^* = 2\mathrm{j} \cdot \mathrm{Im}\,(z)$$

Euler's identity

$$e^{j\theta} = \cos\theta + j\sin\theta \qquad j = \sqrt{-1}$$

$$\cos(\theta) = \frac{e^{j\theta} + e^{-j\theta}}{2}$$

$$\sin(\theta) = \frac{e^{j\theta} - e^{-j\theta}}{2j}$$