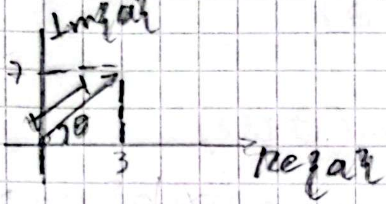
Ejercicio

① $x^2+x+1=\left(x-\left(-\frac{1}{2}+j\frac{\sqrt{3}}{2}\right)\right)\left(x-\left(-\frac{1}{2}-j\frac{\sqrt{3}}{2}\right)\right)$

② $a = 3 + j7 \in \mathbb{C}$

Eje



$|a| = \sqrt{Re^2\{a\}+Im^2\{a\}}$

$\cos(\theta)$, $\operatorname{sen}(\theta)$

$\tan(\theta)=\frac{Im\{a\}}{Re\{a\}}$

$|r_{1,2}| = ?$

$\theta_{r_1, r_2} = ?$

Solución

① $x^2+x+1=\left(x-\left(-\frac{1}{2}+j\frac{\sqrt{3}}{2}\right)\right)\left(x-\left(-\frac{1}{2}-j\frac{\sqrt{3}}{2}\right)\right)$

$=\left(x+\frac{1}{2}-j\frac{\sqrt{3}}{2}\right)\left(x+\frac{1}{2}+j\frac{\sqrt{3}}{2}\right)$

$=x^2+\frac{x}{2}+j\frac{\sqrt{3}}{2}x+\frac{x}{2}+\frac{1}{4}+j\frac{\sqrt{3}}{4}-j\frac{\sqrt{3}}{2}x-j\frac{\sqrt{3}}{4}+\frac{3}{4}$

$=x^2+x+1$

② $a = 3 + j7 \in \mathbb{C}$

$r = |a| = \sqrt{3^2+7^2} = \sqrt{9+49} = \sqrt{58}$

$\theta = \arctan\left(\frac{7}{3}\right)$

$a = re^{j\theta} = \sqrt{58}\, e^{j\arctan(7/3)}$

$$z_k = \sqrt{r}\, e^{j\frac{\theta + 2\pi k}{2}}, \quad k = 0, 1$$

donde $\sqrt{r} = \sqrt[4]{58}$

$K = 0$

$$z_0 = \sqrt[4]{58}\, e^{j\frac{\theta}{2}}$$

$K = 1$

$$z_1 = \sqrt[4]{58}\, e^{j\frac{\theta + 2\pi}{2}} = \sqrt[4]{58}\, e^{j\left(\frac{\theta}{2} + \pi\right)}$$

Magnitud de ambas raíces: $|z_0| = |z_1| = \sqrt[4]{58}$

Para z_0: $\phi_0 = \frac{\theta}{2} = \frac{1}{2} \arctan\left(\frac{7}{3}\right)$

Para z_1: $\phi_1 = \frac{\theta}{2} + \pi$

$r = \sqrt{58} \approx 7.6158$

$\sqrt{r} = \sqrt[4]{58} \approx \sqrt{7.6158} \approx 2.7597$

$\theta = \arctan\left(\frac{7}{3}\right) \approx \arctan(2.3333) \approx 66.8° \approx 1.1659$ rad

Entonces

z_0:

Magnitud ≈ 2.7597

Ángulo $\approx \frac{66.8°}{2} = 33.4° \approx 0.5830$ rad

z_1:

Magnitud ≈ 2.7597

Ángulo $\approx 33.4° + 180° = 213.4° \approx 3.7246$ rad