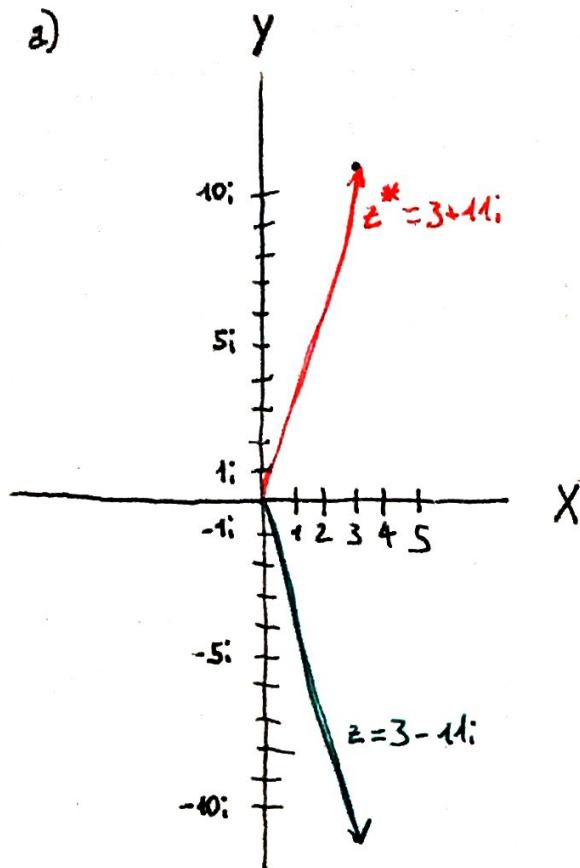


1. a)



$$z^* = 3 + 11i$$

$$|z^*| = \sqrt{3^2 + 11^2} = 11.402 = r^*$$

$$\varphi^* = \tan^{-1}\left(\frac{3}{11}\right) = 1.305$$

$$z^* = \sqrt{130} \cdot \left(\cos \left(\tan^{-1}\left(\frac{3}{11}\right) \right) + i \cdot \sin \left(\tan^{-1}\left(\frac{3}{11}\right) \right) \right)$$

$$= 11.402 \cdot (\cos(1.305) + i \cdot \sin(1.305))$$

Polarform

$$z^* = \sqrt{130} \cdot e^{i \cdot \tan^{-1}\left(\frac{3}{11}\right)} = 11.402 \cdot e^{i \cdot 1.305}$$

Exponentialform

$$z = 3 - 11i$$

$$|z| = \sqrt{3^2 + (-11)^2} = 11.402 = r$$

$$\varphi = 2 \cdot \pi - \tan^{-1}\left(\frac{11}{3}\right) = 4.973$$

$$z = 11.402 \cdot (\cos(4.973) + i \cdot \sin(4.973))$$

Polarform

$$z = 11.402 \cdot e^{i \cdot 4.973}$$

Exponentialform

b) $z = 4 \cdot (\cos(-40^\circ) + i \cdot \sin(-40^\circ)) + 2 \cdot e^{i \cdot 30^\circ} - 3 + 1.5i$

$$= 4 \cdot (\cos(320^\circ) + i \cdot \sin(320^\circ)) + 2 \cdot e^{i \cdot 30^\circ} - 3 + 1.5i$$

$$= 4 \cdot (\cos(320^\circ) + i \cdot \sin(320^\circ)) + 2 \cdot (\cos(30^\circ) + i \cdot \sin(30^\circ)) - 3 + 1.5i$$

$$= 4 \cdot (0.904 + i \cdot (-0.428)) + 2 \cdot (0.154 + i \cdot (-0.988)) - 3 + 1.5i$$

$$= (3.615 - 1.713i) + (0.308 - 1.976i) - 3 + 1.5i$$

$$= (3.615 + 0.308 - 3) + (-1.713i - 1.976i + 1.5i)$$

$$= \underline{\underline{0.923 + 2.189i}}$$

$$\Rightarrow \underline{\underline{z^* = 0.923 - 2.189i}}$$

Mit rad
berechnen!

$$c) z_1 = \frac{2+i}{1-2i} \Rightarrow z_1^* = \frac{2-i}{1+2i} \cdot \frac{(1-2i)}{(1-2i)} = \frac{2-i-i+2i^2}{1-2i+2i-4i^2} = \frac{-5i}{5} = -i$$

$$z_2 = 2e^{-i\frac{\pi}{3}}$$

$$= 2 \cdot \left(\cos\left(-\frac{\pi}{3}\right) + i \cdot \sin\left(-\frac{\pi}{3}\right) \right)$$

$$= 2 \cdot \left(\cos\left(2\pi - \frac{\pi}{3}\right) + i \cdot \sin\left(2\pi - \frac{\pi}{3}\right) \right)$$

$$= 2 \cdot \left(\cos\left(\frac{5\pi}{3}\right) + i \cdot \sin\left(\frac{5\pi}{3}\right) \right)$$

$$= 1 - 1.732i$$

$$z_3 = 4 \cdot (\cos(30^\circ) + i \cdot \sin(30^\circ))$$

$$= 4 \cdot \left(\cos\left(30^\circ \cdot \frac{2\pi}{360^\circ}\right) + i \cdot \sin\left(30^\circ \cdot \frac{2\pi}{360^\circ}\right) \right)$$

$$= 4 \cdot \left(\cos\left(\frac{\pi}{6}\right) + i \cdot \sin\left(\frac{\pi}{6}\right) \right)$$

$$= 3.464 + 2i$$

$$\Rightarrow \frac{z_1^* \cdot z_3}{0.5 \cdot z_2} = \frac{(-i) \cdot (3.464 + 2i)}{0.5 \cdot (1 - 1.732i)} = \frac{2 - 3.464i}{0.5 - 0.866i} = \frac{2 - 3.464i}{0.5 - 0.866i} \cdot \frac{0.5 + 0.866i}{0.5 + 0.866i}$$

$$= \frac{(1 + 3.000000001 + i \cdot (-1.732) - 1.732)}{0.25 + 0.75} = \frac{4.000000001 - 3.464i}{1} = \underline{\underline{4.000000001 - 3.464i}}$$

d) Exponential Form:

$$\left. \begin{aligned} r &= \sqrt{1^2 + (\sqrt{2})^2} = \sqrt{3} \approx 1.732 \\ \varphi &= \tan^{-1}(\sqrt{2}) \approx 0.955 \end{aligned} \right\} \left(\sqrt{3} \cdot e^{i \cdot \tan^{-1}(\sqrt{2})} \right)^3 = \underline{\underline{5.196 \cdot e^{i \cdot 2.866}}}$$