

Lsg Vorschlag LAÜ12 Maximilian Maag

Aufgabe A

a)

$$\begin{aligned}z &= \|z\| \cdot e^{i \cdot \phi} \\ \|z\| &= \sqrt{5^2} = 5 \\ z &= 5 \cdot e^{90 \cdot i}\end{aligned}$$

b)

$$\begin{aligned}\phi &= \frac{2}{\sqrt{2^2 + (2\sqrt{3})^2}} \\ \phi &= \operatorname{asin}\left(\frac{2}{\sqrt{4+4 \cdot 3}}\right) \\ \phi &= \operatorname{asin}\left(\frac{2}{\sqrt{16}}\right) \\ \phi &= \operatorname{asin}\left(\frac{2}{4}\right) \\ \phi &= \operatorname{asin}\left(\frac{2}{4}\right) \\ \phi &= \operatorname{asin}\left(\frac{1}{2}\right) \\ \phi &= 30^\circ \\ \|z\| &= \sqrt{4+12} \\ \|z\| &= \sqrt{16} \\ \|z\| &= 4 \\ z &= 4 \cdot e^{\frac{\pi}{4} \cdot i}\end{aligned}$$

c)

$$\begin{aligned}z &= 2(\cos(30^\circ) + i \cdot \sin(30^\circ)) \\ z &= 1,73205 + i\end{aligned}$$

d)

$$\begin{aligned}z &= 3(\cos(60^\circ) + i \cdot \sin(60^\circ)) \\ z &= \frac{3}{2} + i \cdot 0,866025 \cdot 3\end{aligned}$$

Aufgabe B

a)

b)

$$\begin{aligned}x^2 + 3 &= 0 \\ x^2 &= -3 \\ x^2 &= -3 \\ x^2 &= 3 \cdot e^{i \cdot \pi} \\ x_1 &= (3 \cdot e^{i \cdot \pi})^{\frac{1}{2}}\end{aligned}$$

$$x_1 = \sqrt{3} \cdot e^{i \cdot \frac{\pi}{2}}$$

$$x_2 = \sqrt{3} \cdot e^{i \cdot \frac{3\pi}{2}}$$

c)

$$2x^3 - 8x^2 + 40x = 0$$

$$x \cdot (2x^2 - 8x + 40) = 0$$

$$x_1 = 0$$

$$2x^2 - 8x + 40 = 0$$

$$x^2 - 4x + 20 = 0$$

$$x_{2,3} = 2 + -\sqrt{4 - 20}$$

$$x_{2,3} = 2 + -\sqrt{-16}$$

$$x_2 = 2 + \sqrt{-16}$$

$$x_2 = 2 + \sqrt{-1} \cdot \sqrt{16}$$

$$x_2 = 2 + i \cdot 4$$

$$x_3 = 2 - i \cdot 4$$

d)

$$x^3 = 1 + i$$