Technische Hochschule Rosenheim
Applied Artificial Intelligence - Bachelor
Analysis 1
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WiSe 2021/22

Thursday, 25.11.2021

Exercise 8: functions III

Exercise 24

Let

$$z_1 = 1+i, \quad z_2 = 2+i, \quad z_3 = 3+4i, \quad z_4 = 4-3i, \quad z_5 = i.$$

↳ 90° $1e^{i\frac{\pi}{2}}$

a) Express z_1+z_3, $z_1 z_2$, z_1/z_2, z_1^2, and z_4/z_3 in cartesian coordinates and calculate their modulus.

b) Plot z_1, z_4/z_3, and z_5 and express these complex numbers in polar coordinates.

$\sqrt{1+1} \cdot \exp(i \cdot \arctan(\frac{1}{1})) = \sqrt{2}\, e^{i\frac{\pi}{4}}$

$\hat{=} 45°$

Exercise 25

Solve for $x \in \mathbb{R}^+$

$1\exp(i \cdot 270°) = e^{-i\frac{\pi}{2}}$

a) $\ln(\sqrt{x}) + \frac{3}{2}\ln(x) = \ln(21x)$

b) $\exp(x^2 - 2x) = 2$

c) $\ln^2(x) - \ln(x) = 2 + \frac{1}{4}\ln(x^2)$

Exercise 26

Show for all $x \in \mathbb{R}$

a) $\cosh(-x) = \cosh(x)$, $\sinh(-x) = -\sinh(x)$

b) $\cosh^2(x) - \sinh^2(x) = 1$

c) $\cosh : \mathbb{R} \to \mathbb{R}$ and $\sinh : \mathbb{R} \to \mathbb{R}$ are continuous on $\mathbb{R}$.

d) Addition theorems of cosh and sinh:
For all $x, y \in \mathbb{R}$ there holds:

$$\cosh(x+y) = \cosh(x)\cosh(y) + \sinh(x)\sinh(y),$$
$$\sinh(x+y) = \sinh(x)\cosh(y) + \cosh(x)\sinh(y).$$