Mathematics for Systems Biology and Bioinformatics
Lecture Prof. Dr. Thomas Filk
Tutorials Dr. Tim Maiwald, Christian Tönsing

Exercise sheet no. 10
Submission until 16.1.2013 10:00 am in the tutorials

Homework 15: Complex Numbers I (6 Points)

a) Draw the both complex numbers

$$z_1 = \sqrt{12} + 2\,i \quad , \quad z_2 = 1 + \sqrt{3}\,i$$

in the complex plane. Calculate the complex conjugates $\bar{z}_1, \bar{z}_1$ and draw them in the same image.

b) Transform both numbers in polar coordinates: $z = r\,e^{i\,\phi}$. Which meaning has the absolute value $|z_i|$ in the complex plane?

c) Calculate $z_1 + z_2$ and draw the result into the image.

d) Calculate $z_1 z_2$ using the cartesian ($z = a + ib$) *and* polar display ($z = r\,e^{i\,\phi}$).

e) Using this example show that $\overline{z_1 z_2} = \bar{z}_1 \bar{z}_2$ and $|z_1 z_2| = |z_1||z_2|$

f) Give the real part and the imaginary part of the following complex numbers and calculate their absolute value $|z_i|$.

$$z_3 = e^{i\,\pi/2} \;, \quad z_4 = (1+i)\,e^{i\pi}\,(1-i) \;, \quad z_5 = 2e^{i\,\pi/4}$$

Homework 16: Complex Numbers II (4 Points)

a) Solve for z

$$2 - 9i = (1 - 2i)(z - 3 + 4i)$$

b) For which real numbers $a, b \in \mathbb{R}$ holds

$$2a - 3bi + ai(1+i) + 5b + 3 - i = 0$$

Hint: From the equation in complex numbers, you get two equations in real numbers.