

## Complex numbers: short syllabus

Complex numbers:  $z \in \mathbf{C}$ ,  $z = x + yi$ ,  $i^2 = -1$ .

Arithmetical operations with complex numbers.

The conjugate number  $\bar{z} = x - yi$  and the properties of the conjugation.

The complex plane. The absolute value and the argument of the complex number. The formula by de Moivre:

$$z = |z|(\cos(\arg(z)) + i \sin(\arg(z)))$$

Multiplication and division of the complex numbers using the Moivre formula.

Calculation of  $z^n$ ,

$$z^n = |z|^n (\cos[n \arg(z)] + i \sin[n \arg(z)]),$$

and  $z^{1/n}$  for any natural  $n$  (all  $n$  values of  $z^{1/n}$ ):

$$z^{1/n} = |z|^{1/n} (\cos[(\arg(z)+2\pi k)/n] + i \sin[(\arg(z)+2\pi k)/n]), \quad k = 0, 1, \dots, n-1.$$