



Norwegian University of Science  
and Technology  
Department of Mathematical  
Sciences

MA1102  
Grunnkurs i analyse II  
Vår 2024

**Exercise set 1**

- 1 Write the following complex numbers in polar form.
  - (a)  $\sqrt{3} + i$
  - (b)  $\sqrt{3} - i$
- 2 Find the argument of  $z = \frac{-1}{2} + \frac{\sqrt{3}}{2}i$ .
- 3 Write the complex number  $4e^{\frac{\pi}{4}i}$  on the form  $a + bi$ , where  $a$  and  $b$  are real numbers.
- 4
  - (a) Give an example of a subset  $X$  of  $\mathbb{R}$  such that the infimum of  $X$  is an element in  $X$ .
  - (b) Give an example of a subset  $Y$  of  $\mathbb{R}$  such that the supremum of  $Y$  is *not* contained in the set  $Y$ .
- 5 Let  $X$  be the subset of  $\mathbb{R}$  given by  $X = \{\frac{1}{n} : n \in \mathbb{N}\}$ , where  $\mathbb{N}$  denotes the natural numbers  $\{1, 2, 3, \dots\}$ . Determine the supremum and infimum of  $X$ .
- 6 Prove that the least upper bound and greatest lower bound for a set of real numbers is unique.
- 7 Prove the following property of the supremum:  
If  $A$  and  $B$  are subsets of the reals and  $A + B = \{a + b : a \in A, b \in B\}$ , then

$$\sup A + \sup B = \sup(A + B).$$