

# Complex functions for Engineering Students

## work sheet 2

### Exercise 1:

Find the images of the domains  $D$ ,  $\tilde{D}$  and  $\hat{D}$ , respectively, regarding the following functions. Sketch the domains and the images.

a)  $D = \{z \in \mathbb{C} : |\operatorname{Re}(z)| \leq 4, |\operatorname{Im}(z)| \leq 2\},$

$$f_1(z) = 0.5z, \quad f_2(z) = 0.5e^{i\frac{\pi}{2}}z,$$

b)  $\tilde{D} = \{z \in \mathbb{C} : 1 \leq |z| \leq 2, \operatorname{Re}(z) > 0, \operatorname{Im}(z) < 0\},$

$$f_3(z) = (e^{i\frac{\pi}{4}}z)^2, \quad f_4(z) = (e^{i\frac{\pi}{4}}z)^2 + 1 + i, \quad f_5(z) = \frac{1}{z}.$$

c)  $\hat{D} := \{z \in \mathbb{C} : z = x + iy, x \in (0, 2), y \in (0, \frac{\pi}{2})\},$

$$f(z) := i \cdot e^z.$$

### Exercise 2)

Find all solutions  $z \in \mathbb{C}$  of the following equations

i)  $e^z = -1,$                       ii)  $e^z = -2\sqrt{2} - 2\sqrt{2}i,$

iii)  $z^5 = 32,$                       iv)  $z^5 = 16(1 + i\sqrt{3}),$

**Classes:** 18.4.22 - 22.4.22