Fachbereich Mathematik der Universität Hamburg **SoSe 2024**
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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 or describe them in words.

a) $D = \{z \in \mathbb{C} : |\mathrm{Re}\,(z)| \leq 4,\, |\mathrm{Im}\,(z)| \leq 2\}\,,$
$f_1(z) = 0.5z, \quad f_2(z) = 0.5e^{i\frac{\pi}{2}}z\,,$

b) $\tilde{D} = \{z \in \mathbb{C} : 1 \leq |z| \leq 2,\, \mathrm{Re}\,(z) > 0\,,\, \mathrm{Im}\,(z) < 0\},$
$f_3(z) = \left(e^{i\frac{\pi}{4}}z\right)^2,\, f_4(z) = \left(e^{i\frac{\pi}{4}}z\right)^2 + 1 + i,\, f_5(z) = \frac{1}{z}\,.$

c) $\hat{D} := \left\{ z \in \mathbb{C} : z = x + iy,\, x \in (0,2),\, y \in \left(0, \frac{\pi}{2}\right)\right\}\,,$
$f(z) := i \cdot e^z\,.$

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) $z^5 = 16(1 + i\sqrt{3}).$

Class: 22.04.24