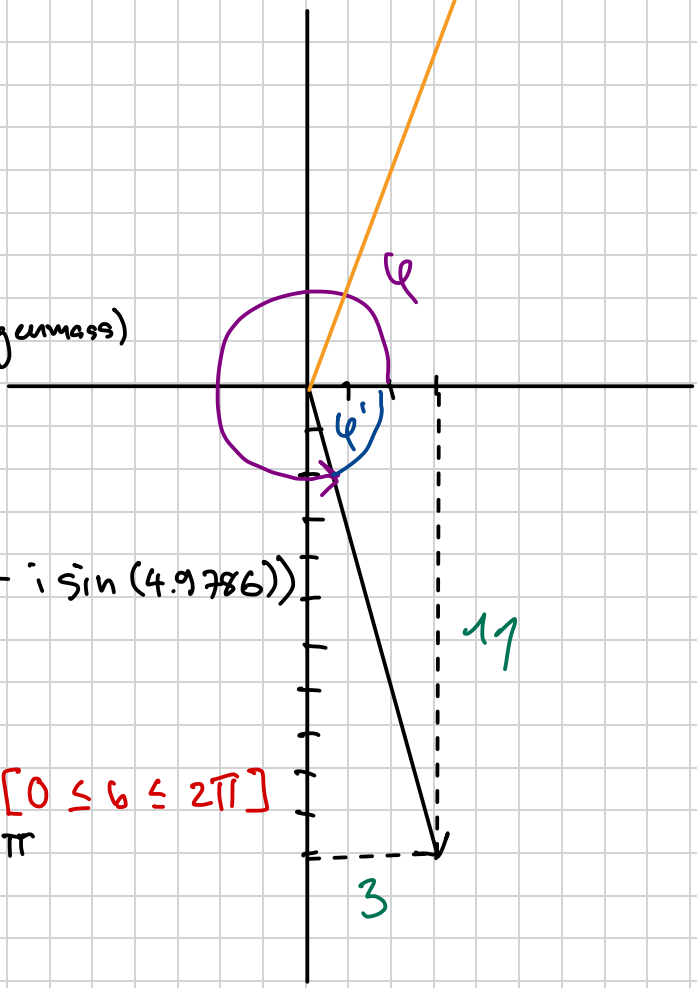
1) a) $z = 3 - 11i$

$r = \sqrt{11^2 + 3^2} = \sqrt{130} = 11.402$

$\varphi = 2\pi - \tan^{-1}\left(\frac{11}{3}\right) = 4.9786$ (Bogenmass)



$z_E = 11.402 \cdot e^{i \cdot 4.9786}$

$z_T = 11.402 \cdot (\cos(4.9786) + i \sin(4.9786))$

$z_N^* = 3 + 11i$

$z_E^* = 11.402 \cdot e^{i(-4.9786)}$ $[0 \leq \varphi \leq 2\pi]$

$= 11.402 \cdot e^{i(-4.9786) \cdot 2\pi}$

$= 11.402 \cdot e^{i\,1.3406}$

$= 11.402 \cdot e^{i\left(\tan^{-1}\left(\frac{11}{3}\right)\right)} = 11.402 \cdot e^{i\,74.78}$

$z_T^* = 11.402 \cdot (\cos(1.3046) + i \sin(1.3046))$

b) $z = 4(\cos(-40°) + i\sin(-40°)) + 2e^{i30°} - 3 + 1.5i$

$z = 3.064 - 2.751 \cdot i + 2 \cdot (\cos(30°) + 2 \cdot i\sin(30°) - 3 + 1.5i$

$= 3.064 - 2.751 \cdot i + 1.732 + i - 3 + 1.5i$

$= 1.796 - 0.071i$

$z^* = 1.796 + 0.071i$

c) $z_1 = \frac{(2+i)}{(1-2i)} \frac{(1+2i)}{(1+2i)} = \frac{2 + 4i + i + 2i^2}{1^2 - (2i)^2} = \frac{5i}{5} = i$ ($i^2 \to -2$)

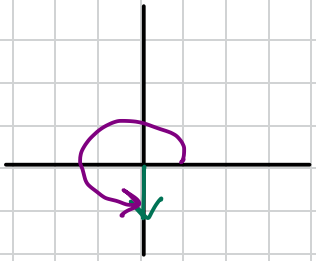
$2i \cdot 2i = 4i^2 = -4$

$z_1^* = -i$

$r = \sqrt{0^2 + 1^2} = 1$

$\varphi = \frac{3\pi}{2}$

$z_{1E}^* = 1 \cdot e^{i\frac{3\pi}{2}}$



$z_3 = 4(\cos(30°) + i\sin(30°))$ → $r = 4$, $\varphi = 30° = \frac{\pi}{6}$

$z_{3E} = 4e^{i\frac{\pi}{6}}$

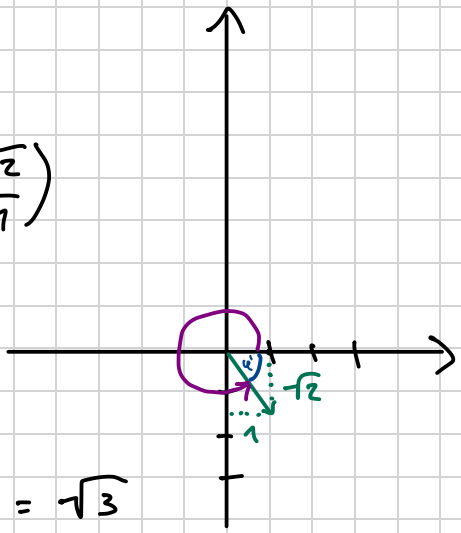
$z_2 = 2e^{-i\frac{\pi}{3}}$

$= 4e^{i(\frac{3\pi}{2} + \frac{\pi}{6} + \frac{\pi}{3})}$

$\longrightarrow \frac{e^{i\frac{3\pi}{2}} \cdot 4e^{i\pi/6}}{e^{-i\frac{\pi}{3}}} = 4e^{i\frac{3\pi}{2}} \cdot e^{i\frac{\pi}{6}} \cdot e^{i\frac{\pi}{3}}$

$= 4e^{i2\pi} = 4e^{i\cdot 0} = 4$

d) $(1-\sqrt{2}\,i)^3$



Was ist φ?

$\varphi = 2\pi - \tan^{-1}\left(\frac{\sqrt{2}}{1}\right)$

$= 5.3279$

Was ist r?

$r = \sqrt{1^2 + \sqrt{2}^2} = \sqrt{3}$

$z_E = \sqrt{3} \cdot e^{i \cdot 5.3279}$

$= \left(\sqrt{3} \cdot e^{i \cdot 5.3279}\right)^3 = \sqrt{3}^3 \cdot e^{i \cdot 5.3279 \cdot 3}$

$= \sqrt{3}^3 \cdot e^{i \cdot 15.9837} = \sqrt{3}^3 \cdot e^{i \cdot (15.9837 - 4\pi)}$

$= \sqrt{3}^3 \cdot e^{i \cdot 3.4173}$

$= 3 \cdot \sqrt{3} \cdot (\cos(3.4173) + i \sin(3.4173))$

$= -5.000 - 1.415\,i$