komplexe Zahlen:

$\underline{z} = a + jb = r \cdot e^{j\varphi} = r \angle \varphi$

$\underline{z}^* = a - jb = r \cdot e^{-j\varphi} = r \angle -\varphi$

$a = r \cdot \cos\varphi \;,\; b = r \cdot \sin\varphi$

$|\underline{z}| = |z| = r = \sqrt{a^2 + b^2}$

$\varphi = \arctan\left(\frac{b}{a}\right) = \arctan\left(\frac{\mathrm{Im}(\underline{z})}{\mathrm{Re}(\underline{z})}\right)$

$\underline{z}_1 \cdot \underline{z}_2 = r_1 \cdot r_2 \cdot e^{j(\varphi_1 + \varphi_2)}$

$\frac{\underline{z}_1}{\underline{z}_2} = \frac{r_1}{r_2} \cdot e^{j(\varphi_1 - \varphi_2)}$

$\underline{z}_1 + \underline{z}_2 = \sqrt{(a_1 + a_2)^2 + (b_1 + b_2)^2} \cdot e^{j \arctan\left(\frac{b_1 + b_2}{a_1 + a_2}\right)}$

Beispiele:

(1) $\underline{z} = 80\,\Omega \angle 20^\circ \;\hat{=}\; 80 \cdot e^{j20^\circ}$

$a = 80 \cos(20^\circ) = 75{,}17$
$b = 80 \sin(20^\circ) = 27{,}36$
$\Big\}\; \underline{z} = 75{,}17 + j\,27{,}36$

Kontrolle: $r = \sqrt{a^2 + b^2} = \sqrt{75{,}17^2 + 27{,}36^2} = 79{,}999$

$\varphi = \arctan\left(\frac{27{,}36}{75{,}17}\right) = 20{,}001^\circ$

(2) $75\,\Omega \angle -30^\circ \Rightarrow a = 75 \cdot \cos(-30^\circ) = 64{,}95$

$b = 75 \cdot \sin(-30^\circ) = -37{,}5$

$\underline{z} = 64{,}95 - j\,37{,}5$

Kontrolle: $r = \sqrt{64{,}95^2 + 37{,}5^2} = 74{,}999$

$\varphi = \arctan\left(\frac{-37{,}5}{64{,}95}\right) = -30{,}0^\circ$