

# Komplexe Zahlen

## Polardarstellung

### Multiplikation

$$z_1 z_2 = r_1 r_2 (\cos \varphi_1 + i \sin \varphi_1) (\cos \varphi_2 + i \sin \varphi_2)$$

$$= r_1 r_2 \left[ (\cos \varphi_1 \cos \varphi_2 - \sin \varphi_1 \sin \varphi_2) + i (\sin \varphi_1 \cos \varphi_2 + \cos \varphi_1 \sin \varphi_2) \right]$$

Additionstheoreme der trigonometrischen Funktionen

$$= r_1 r_2 \left[ \cos(\varphi_1 + \varphi_2) + i \sin(\varphi_1 + \varphi_2) \right] = r (\cos \varphi + i \sin \varphi)$$

$$\rightarrow r = r_1 r_2, \quad \varphi = \varphi_1 + \varphi_2$$

Division  $\frac{z_1}{z_2} \rightarrow r = \frac{r_1}{r_2}, \quad \varphi = \varphi_1 - \varphi_2$