

$$\begin{aligned} z_1 z_2 &= r_1 r_2 \operatorname{cis}(\theta_1 + \theta_2) \\ \frac{z_1}{z_2} &= \frac{r_1}{r_2} \operatorname{cis}(\theta_1 - \theta_2) \end{aligned}$$

$$1. \quad z_1 = x_1 + iy_1 = r_1(\cos\theta_1 + i\sin\theta_1)$$

$$z_2 = x_2 + iy_2 = r_2(\cos\theta_2 + i\sin\theta_2)$$

$$\Rightarrow z_1 z_2 = r_1 r_2 (\cos\theta_1 + i\sin\theta_1)(\cos\theta_2 + i\sin\theta_2)$$

$$= r_1 r_2 (\cos\theta_1 \cos\theta_2 - \sin\theta_1 \sin\theta_2 + i(\sin\theta_1 \cos\theta_2 + \cos\theta_1 \sin\theta_2))$$

$$= r_1 r_2 (\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)) = r_1 r_2 \operatorname{cis}(\theta_1 + \theta_2)$$

$$\textcircled{2} \quad \frac{z_1}{z_2} = \frac{r_1}{r_2} \frac{\cos\theta_1 + i\sin\theta_1}{\cos\theta_2 + i\sin\theta_2}, \quad (z_2 \neq 0)$$

$$= \frac{r_1}{r_2} (\cos\theta_1 + i\sin\theta_1)(\cos\theta_2 - i\sin\theta_2)$$

$$= \frac{r_1}{r_2} (\cos\theta_1 \cos\theta_2 + \sin\theta_1 \sin\theta_2 + i(\sin\theta_1 \cos\theta_2 - \cos\theta_1 \sin\theta_2))$$

$$= \frac{r_1}{r_2} (\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)) = \frac{r_1}{r_2} \operatorname{cis}(\theta_1 - \theta_2)$$