

Part 1

$$D_3 = \{ e, c, c^2, b, bc, bc^2 \}$$

$$\tilde{D}(\alpha) = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}$$

$$D(e) = 1I_2$$

$$D(c) = \tilde{D}\left(\frac{2\pi}{3}\right)$$

$$D(c^2) = \tilde{D}\left(\frac{4}{3}\pi\right)$$

$$D(b) = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$