

3. (5 points) Suppose A commutes with every 2 by 2 matrix ($AB = BA$). Show that

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \text{ is a multiple of the identity, i.e., } A = \begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix}$$

4. (5 points) Compute the following three matrices:

$$\begin{bmatrix} 1 & 0 & 0 \\ \alpha & 1 & 0 \\ \beta & 0 & 1 \end{bmatrix}^n,$$

$$\begin{bmatrix} 1 & 0 & 0 \\ \alpha & 1 & 0 \\ \beta & 0 & 1 \end{bmatrix}^{-1},$$

$$\begin{bmatrix} 1 & 0 & 0 \\ \alpha & 1 & 0 \\ 0 & \beta & 1 \end{bmatrix}^{-1}$$