

Solution (#604) Show first that $a + d = 0$ if

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}^2 = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}.$$

Note $a^2 + bc = 0$ can be rewritten as

$$a^2 + \left(\frac{b+c}{2}\right)^2 = \left(\frac{b-c}{2}\right)^2.$$

Square roots of 0_{22} have the form

$$\begin{pmatrix} z \cos \alpha & z \sin \alpha + z \\ z \sin \alpha - z & -z \cos \alpha \end{pmatrix}.$$