2. Let $J=\left[\begin{matrix}0&1\\1&0\end{matrix}\right]$.

 (a) What is the smallest set which contains $J$ and which is closed under matrix multiplication?

 (b) What is the smallest set which contains both $J$ and $-J$, and which is closed under matrix multiplication?

 **Prove your answers. Use complete and proper set notation. Be sure to prove necessity and sufficiency.**