Practice on Orthogonality

(1) Find the orthogonal complement of $\{\mathbf{v}\}$, where $\mathbf{v} = \begin{bmatrix} a \\ b \end{bmatrix}$.

(2) Observe that $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ is not in the column space of $A = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$. Write down and solve the normal equations for this system.

(3) Now observe that $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ is in the column space of $A = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$. Solve this system.

(4) Write down and solve the normal equations for this system of the previous problem.