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Quiz for June 14, 2007

Let $\boldsymbol{a}$ and $\boldsymbol{b}$ be vectors in $\mathbb{R}^3$, and let W be the subset of $\mathbb{R}^3$ defined by

$$W = \{\boldsymbol{x} \mid \boldsymbol{a}^{\mathrm{T}}\boldsymbol{x} = 0 \quad \text{and} \quad \boldsymbol{b}^{\mathrm{T}}\boldsymbol{x} = 0\}.$$

Prove that W is a subspace of $\mathbb{R}^3$.

ANSWER: We see that W is the nullspace of the matrix

$$\left[\begin{array}{c} \boldsymbol{a}^{\mathrm{T}} \\ \hline \boldsymbol{b}^{\mathrm{T}} \end{array}\right].$$

We know that the Null space of every matrix is a vector space.