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Math 221
Quiz
Nov. 25, 1996

Work in $\mathbb{R}^4$ with the Euclidean inner product. Consider the two vectors $\vec{u} = (1, 1, 1, 0)$ and $\vec{v} = (-1, 1, 0, 1)$; both of whose norm is $\sqrt{3}$. Let W be the space spanned by these two vectors. (Be sure to show all needed work.)

(3 points) Are $\vec{u}$ and $\vec{v}$ orthogonal?　　(8 points) Find a basis for $W^\perp$.

(3 points) Assume $A = \vec{u}$

$\vec{v}$ and $A\vec{x}_0 = \vec{b}$. Find the general solution to $A\vec{x} = \vec{b}$ (in terms of $\vec{x}_0$). (Hint: use the answer to the last problem.)   (3 points) Use the answer to problem to find a basis for $\mathbb{R}^4$ that includes $\vec{u}$ and

$\vec{v}$.   (8 points) Write $\vec{w} = (0, 2, 4, 1)$ as the $\vec{w}_1 + \vec{w}_2$, where $\vec{w}_1$ is in W and $\vec{w}_2$ is in $W^\perp$. (Hint:

The answer to will be useful here and the fact that the norm of $\vec{u}$ and $\vec{v}$ is $\sqrt{3}$.)