Let V be a subspace of $\mathbf{R}^4$ whose basis is $\vec{x_1} = (1, 0, 1, 0, 0)$, $\vec{x_2} = (0, 1, -1, -1, 0)$ and $\vec{x_3} = (0, 0, 10, 0, 10)$. Find an orthogonal basis B for V. (Here it might be useful to multiply one of the vectors you get to avoid fractional entries.) Find an orthonormal basis for V. Find a basis for $V^\perp$. (Hint: The orthogonal complement of the rowspace of a matrix A is what?) Find an orthogonal basis for $V^\perp$. Expand the basis B found in the first part to an orthogonal basis of $\mathbb{R}^5$. (This does not involve any computations.) Let $\vec{x} = (1, 2, 1, 0, 1)$. Find $proj_V(\vec{x})$, $\vec{z} = \vec{x} - proj_V(\vec{x})$ and $[proj_V(\vec{x})]_B$. (Expect for part (b) all the numbers work out nicely.)