

WORKSHEET 10/19/22
MATH 2331, FALL 2022

In these problems, $\vec{u}_1 = \frac{1}{2}(1, 1, 1, 1)$, $\vec{u}_2 = \frac{1}{2}(1, 1, -1, -1)$, $\vec{u}_3 = \frac{1}{2}(1, -1, 1, -1)$, and $V = \text{Span}(\vec{u}_1, \vec{u}_2, \vec{u}_3)$.

- (1) Can you find a vector \vec{u}_4 such that $\vec{u}_1, \dots, \vec{u}_4$ are orthonormal?
- (2) Suppose that $c_1\vec{u}_1 + c_2\vec{u}_2 + c_3\vec{u}_3 = \vec{0}$. What can you say about c_1 , c_2 , and c_3 ? If you're writing down a matrix, you're working too hard!
- (3) Find a basis for V . Don't work too hard!
- (4) Extend your basis from #3 to a basis \mathfrak{B} for \mathbb{R}^4 . Don't work too hard!
- (5) Given a vector \vec{x} in \mathbb{R}^4 , what is $[\vec{x}]_{\mathfrak{B}}$? If you're writing down a matrix, you're working too hard!
- (6) Suppose that $\mathfrak{B} = \{\vec{u}_1, \vec{u}_2, \vec{u}_3, \vec{u}_4\}$ is an orthonormal basis for \mathbb{R}^4 . If $V = \text{Span}(\vec{u}_1, \vec{u}_2, \vec{u}_3)$, find $[\text{proj}_V]_{\mathfrak{B}}$.
- (7) Let L be the line parallel to $\vec{v}_1 = (3, 4, 0)$. Find an orthonormal basis for L .
- (8) Let V the plane spanned by $\vec{v}_1 = (3, 4, 0)$ and $\vec{v}_2 = (1, 0, 0)$. Extend the basis you found in #7 to a basis for V .