Let
$$\vec{u_1} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$
, $\vec{u_2} = \begin{bmatrix} 3 \\ 0 \\ 1 \end{bmatrix}$, and $\vec{u_3} = \begin{bmatrix} 1 \\ -1 \\ -1 \end{bmatrix}$

- 1. Find a vector $\vec{\mathbf{x}} \in \mathbb{R}^3$ that is orthogonal to $\vec{\mathbf{u_1}}$.
- 2. Find a vector $\vec{y} \in \mathbb{R}^3$ that is orthogonal to both $\vec{u_1}$ and $\vec{u_2}$.
- 3. Find all vectors $\vec{z} \in \mathbb{R}^3$ that are orthogonal to $\vec{u_1}$, $\vec{u_2}$, and $\vec{u_3}$.
- 4. Let A be the matrix formed by putting $\vec{u_1}$, $\vec{u_2}$, $\vec{u_3}$ in the rows of A
 - (a) How are the vectors \vec{z} from #3 related to row(A)?
 - (b) In which fundamental subspace of A do the vectors \vec{z} from #3 lie?