Linear Algebra
C Term, Sections C01-C04
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PRACTICE ONLY – DO NOT HAND IN

Linear Algebra Quiz 3

Let $L : \mathbb{R}^3 \to \mathbb{R}^3$ be the linear transformation given by

$$L\left(\begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}\right) = \begin{bmatrix} u_1 + u_2 \\ 2u_2 - u_3 \\ 2u_1 + u_3 \end{bmatrix}.$$

For each of the following vectors $\mathbf{v}$, determine whether or not $\mathbf{v}$ is in the *range* of L. If so, exhibit a vector $\mathbf{u} \in \mathbb{R}^3$ satisfying $L(\mathbf{u}) = \mathbf{v}$.

1.) $\mathbf{v} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}^\top$

2.) $\mathbf{v} = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}^\top$

3.) $\mathbf{v} = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}^\top$

4.) $\mathbf{v} = \begin{bmatrix} 0 \\ 5 \\ -5 \end{bmatrix}^\top$