

Please write up complete, clear solutions on your own paper. We will be looking for your **reasoning and explanations**, not just a correct answer. Please copy each question and write neatly. **For the constructions, you should justify that your construction meets the required criteria.**

This assignment covers material in sections 2.8 and 2.9. The textbook is a helpful reference for these. You can also get help via email (ewhitaker@uky.edu), via office hours (stop by or make an appointment) or possibly in the Mathskeller (depending on who is tutoring at the time).

1. Let H be the set in \mathbb{R}^3 that contains only the zero vector.
 - a. Show directly from the properties that H is a subspace of \mathbb{R}^3 .
 - b. Can you find a basis for H ? Explain.
2. Construct a 3×4 matrix A and a vector \mathbf{b} with \mathbf{b} *not* in $\text{Col } A$.
3. Construct a 4×5 matrix A with $\dim \text{Nul } A = 3$ and $\dim \text{Col } A = 2$.
4. Let A be a 6×4 matrix with linearly independent columns. What can we say about $\text{Nul } A$?
5. What is the rank of a 7×9 matrix whose null space is 4-dimensional?
6. Let \mathcal{B} be a basis for \mathbb{R}^2 given by $\mathcal{B} = \left\{ \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \begin{bmatrix} -3 \\ 1 \end{bmatrix} \right\}$.
 - a. Find the vector \mathbf{x} with $[\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$.
 - b. Find the coordinate vector $[\mathbf{x}]_{\mathcal{B}}$ for the vector $\mathbf{x} = \begin{bmatrix} -8 \\ -1 \end{bmatrix}$.