

Exercise 1.3.22

**Linear Algebra
MATH 2130**

SEBASTIAN CASALAINA

ABSTRACT. This is Exercise 1.3.22 from Lay [LLM16, §1.3]:

Exercise 1.3.22. Construct a 3×3 matrix A , with nonzero entries, and a vector \mathbf{b} in \mathbb{R}^3 such that \mathbf{b} is *not* in the set spanned by the columns of A .

Solution. Consider the matrix

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

Then set spanned by the columns of A is the set of vectors of the form $\{(\alpha, \alpha, \alpha) \mid \alpha \in \mathbb{R}\}$. Therefore the vector $\mathbf{b} = (1, 0, 0)$ is not in the set spanned by the columns of A . □

REFERENCES

[LLM16] David Lay, Stephen Lay, and Judi McDonald, *Linear Algebra and its Applications*, Fifth edition, Pearson, 2016.

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