

Linear Algebra

Instructions Please write your name in the upper right-hand corner of the page. Use complete sentences, along with any necessary supporting calculations, to answer the following questions.

1. Let L be the linear operator on R^3 defined by the property that

$$L \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} x_1 - x_2 \\ x_2 - x_3 \\ x_3 - x_1 \end{pmatrix} .$$

Find a basis for the kernel of L .

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2. Suppose $L: P_2 \rightarrow P_3$ is the linear transformation defined by the property that $L(p(x)) = xp(x)$ for every polynomial $p(x)$. (Recall that P_n denotes the space of polynomials of degree less than n .) Determine the matrix representation of L with respect to the ordered basis $[1, x]$ in P_2 and the ordered basis $[1, 1 + x, 1 + x + x^2]$ in P_3 .