

Linear Algebra

In **problems 10–12**, show your work and explain your method. Continue on the back if you need more space. (15 points per problem)

10. Consider the system of simultaneous equations

$$\begin{cases} x_1 + x_2 + 2x_3 = 1 \\ 2x_1 + x_2 + 3x_3 = 2 \\ 4x_1 + 2x_2 + 6x_3 = k \end{cases}$$

for the unknowns x_1 , x_2 , and x_3 . For which value(s) of k does this system have infinitely many solutions?

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11. Find a basis for the null space of the matrix $\begin{pmatrix} 1 & 0 & 1 & 0 \\ 1 & 2 & 3 & 4 \\ 1 & -1 & 0 & -2 \end{pmatrix}$.

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12. Suppose $A = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 3 & 2 \\ \square & \square & \square \end{pmatrix}$ and $A^{-1} = \begin{pmatrix} 4 & 0 & \square \\ \square & \square & \square \\ \square & \square & 1 \end{pmatrix}$.

Fill in the missing entries, and explain your strategy for finding them.