Linear Algebra

1. Let $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 10 \\ 11 \\ 12 \end{pmatrix}$. Is the vector $\mathbf{b}$ in the column space of the matrix A? Explain why or why not.

2. Let L be the linear transformation from R^3 into R^2 such that (with respect to the standard basis) $L \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} x_2 \\ x_1 \end{pmatrix}$. If $\mathbf{u}_1 = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$, $\mathbf{u}_2 = \begin{pmatrix} 3 \\ 4 \\ -4 \end{pmatrix}$, $\mathbf{u}_3 = \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}$, $\mathbf{v}_1 = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$, and $\mathbf{v}_2 = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, find the matrix representation of L with respect to the ordered bases $[\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3]$ and $[\mathbf{v}_1, \mathbf{v}_2]$.