1. Find the $\mathcal{B}$ – coordinate vector of $\mathbf{x}_1 = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$ relative to the basis $\mathcal{B} = \left\{ \begin{bmatrix} -3 \\ 4 \end{bmatrix}, \begin{bmatrix} -5 \\ 6 \end{bmatrix} \right\}$.

2. Let $T : \mathbb{R}^3 \to \mathbb{R}^3$ be the linear transformation represented by $T(x_1, x_2, x_3) = (2x_3, x_2, 0)$.

   a. Find the standard matrix A which is associated to T.

   b. Is A diagonalizable? If so, find P and D so that $A = PDP^{-1}$:
      i. Find the eigenvalues associated to A.
      ii. Find the associated eigenvectors for those eigenvalues.
      iii. Find P and D (or explain why it is not possible).