1. Let $A = \begin{bmatrix} -2 & -3 & 3 \\ -36 & -74 & 48 \\ -60 & -122 & 80 \end{bmatrix}$

   (a) Find the eigenvectors and eigenvalues of A

   (b) Factor A into a product PDP^{-1}.

   (c) Use your factorization to compute A^{20}. Compare your answer with the answer from Maple.

2. Construct a matrix A with eigenvalues $1, 2, 3$ and eigenvectors $(1, 3, -2)$, $(3, 2, 0)$, and $(-2, 1, 4)$, respectively.

3. Is $A = \begin{bmatrix} 3 & -1 \\ 1 & 1 \end{bmatrix}$ diagonalizable?

4. If A is diagonalizable, is A invertible?
   If it's invertible, is it diagonalizable?