(1) Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$.

    (a) Find the eigenvalues of A.
    (b) For each eigenvalue λ, find a basis for the eigenspace E_λ.
    (c) Is A diagonalizable?

(2) For each eigenvalue λ you found in the previous problem, write down its algebraic and geometric multiplicity. Do you notice anything?

(3) Decide whether the following matrix is diagonalizable:

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 0 & 2 & 3 & 4 & 5 & 6 \\ 0 & 0 & 3 & 4 & 5 & 6 \\ 0 & 0 & 0 & 4 & 5 & 6 \\ 0 & 0 & 0 & 0 & 5 & 6 \\ 0 & 0 & 0 & 0 & 0 & 6 \end{bmatrix}$$