1. Consider the symmetric matrix $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$. Perform the following steps to orthogonally diagonalize A.

   (a) Find the eigenvalues of A.

   (b) Find a basis for each eigenspace.

   (c) You should have found 2 bases in the previous step. Show that the basis with 2 vectors is not an orthogonal set.

   (d) Use the Gram-Schmidt process to find an orthogonal basis for the 2-dimensional eigenspace of A.

   (e) Using your orthogonal basis, construct an orthonormal basis for the 2-dimensional eigenspace.

   (f) Find an orthogonal matrix P and diagonal matrix D such that $A = PDP^{-1} = PDP^T$.