MTH 266, Final Exam Bonus Question, Fall 2020

Consider the matrix $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$.

   a. Find the eigenvalues and eigenvectors of the matrix A.

   b. The matrix A is symmetric. Confirm that the eigenvectors are orthogonal to each other.

   c. The eigenvectors form an orthogonal basis for R^2. Make the basis orthonormal.

   d. Use the fact that the basis is orthogonal to find the coordinates of the vector $\vec{v} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$ in that basis. (use the non-normalized basis)