Happy Thanksgiving. Let A be the matrix $\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$.

1. Find the characteristic polynomial $\det(A - \lambda I)$.

2. Find the eigenvalues of A.

3. Find the eigenvectors of A.

4. (Optional extra credit) Express A as BDB^{-1} where B is the matrix changing to the basis of eigenvectors, and D is a diagonal matrix.