Example 1

Find the eigenvalues and eigenvectors of the following matrix and find the matrix P which make $P^{-1}AP$ diagonal

\[
\begin{pmatrix}
1 & 2 & 2 \\
1 & -1 & 1 \\
4 & -12 & 1
\end{pmatrix}
\]

Example 2

Find the eigenvalues and eigenvectors of the following matrix, if possible find the invertible matrix P that make make $P^{-1}AP$ diagonal

\[
\begin{pmatrix}
2 & -1 & 1 \\
2 & 2 & -1 \\
1 & 2 & -1
\end{pmatrix}
\]