The eigenvalues are \( \lambda_1 = 2 \), \( \lambda_2 = -1 \), and \( \lambda_3 = -1 \).

1. Find an eigenvector \( \vec{x}_i \) corresponding to each \( \lambda_i \).

2. Check that the eigenvectors corresponding to different eigenvalues are orthogonal.

3. Check that the set of 3 vectors are linearly independent.
4. Write \[
\begin{pmatrix}
3 \\
0 \\
0
\end{pmatrix}
\] as a linear combination of your set of eigenvectors \( \{x_i\} \).

5. Two of your eigenvalues are the same. The eigenvectors you found probably aren’t orthogonal. Can you find eigenvectors corresponding to these eigenvalues that are orthogonal?