1. Let \( B = \begin{bmatrix} 12 & -12 \\ 6 & -5 \end{bmatrix} \).

1A. Find the characteristic polynomial of \( B \). Show all your steps.

1B. What, if any, are the eigenvalues of \( B \)?

1C. What number \( m \) should the “6” in \( B \) be replaced with, so that the resulting matrix has \( \lambda = 0 \) as an eigenvalue? (The other eigenvalue will be new, too). How did you find \( m \)?

2. Let \( A = \begin{bmatrix} 2 & 2 & -2 \\ 1 & 1 & 2 \\ 1 & -2 & 5 \end{bmatrix} \).

2A. It’s a fact that \( v = \begin{bmatrix} -5 \\ 5 \\ 5 \end{bmatrix} \) is an eigenvector of \( A \). Find the eigenvalue by direct computation of \( Av \).

2B. It’s a fact that \( \lambda = 3 \) is an eigenvalue of \( A \). Find a basis for its eigenspace.

2C. What is the dimension of the eigenspace in (2B)?