1. (10 points) Find the eigenvalues and eigenvectors of the matrix $\mathbf{A}$ shown.

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} -1 & 3 \\ 2 & 4 \end{bmatrix}$$

2. (10 points) Using Cayley-Hamilton theorem, compute $\mathbf{B}^6$ for the matrix $\mathbf{B}$ shown.

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1. $\lambda_1 = 0, \ \lambda_2 = -4, \ \lambda_3 = 3$

$$\mathbf{K}_1 = \begin{bmatrix} 1 \\ 6 \\ -13 \end{bmatrix}, \quad \mathbf{K}_2 = \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}, \quad \mathbf{K}_3 = \begin{bmatrix} 2 \\ 3 \\ -2 \end{bmatrix}$$

2. $\lambda_1 = -2, \ \lambda_2 = 5; \quad c_0 = 4510, \ c_1 = 2223$

$$\mathbf{B}^6 = \begin{bmatrix} 2287 & 6669 \\ 4446 & 13402 \end{bmatrix}$$