LAB # 3

(SYMBOLIC ALGORITHMS IN LINEAR ALGEBRA)

1. Obtain the formula to compute the characteristic polynomial of a 3×3 matrix.
2. Compute the eigenvalues of the matrix $\begin{pmatrix} 0 & a & a & \cdot\cdot\, a \\ a & 0 & a & \cdot\cdot\, a \\ \vdots & \ddots & \ddots & \vdots \\ a & \cdots & a & 0 \end{pmatrix}$.
3. Obtain a numeric approximation of the eigenvalues of the matrix:

$$A = \begin{pmatrix} 4 & 1 & 3 & 2 & 1 \\ 3 & 0 & 1 & 3 & 3 \\ 0 & 4 & 0 & 1 & 0 \\ 4 & 4 & 0 & 2 & 2 \\ 3 & 2 & 4 & 0 & 1 \end{pmatrix}$$

4. Obtain using Bareiss Method the determinant of the matrices:

$$\begin{pmatrix} 1 & 5 & 3 \\ 1 & 2 & 2 \\ 1 & 3 & 4 \end{pmatrix}, \quad \begin{pmatrix} 2 & 2 & 1 & 1 \\ 1 & 1 & 2 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{pmatrix}, \quad \begin{pmatrix} 2 & 1 & 1 & 1 \\ 3 & 2 & 2 & 0 \\ 2 & 2 & 3 & 2 \\ 3 & 2 & 2 & 2 \end{pmatrix}.$$

5. Solve the following system of linear equations using Bareiss Method:

$$\begin{cases} 3x_1 + 2x_2 + 2x_3 + x_4 &= 2 \\ x_1 + 4x_2 + x_3 + 3x_4 &= 1 \\ x_1 + x_2 + x_3 + x_4 &= 2 \\ x_1 + x_2 + x_3 + 2x_4 &= 2 \end{cases}$$