Finding Eigenvalues using GC

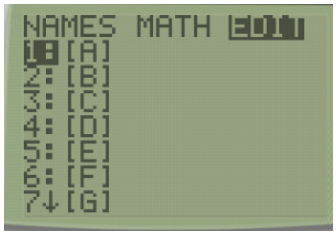
Expanding the determinant of the characteristic equation $\det(\mathbf{A}-\lambda\mathbf{I})=0$ is tedious, and actually, there is a fast method to compute the eigenvalues of a square matrix using the graphing calculator.

EXAMPLE: We wish to find the eigenvalues of the following matrix:

$$\mathbf{A}=\begin{pmatrix}-2 & -4 & 2\\ -2 & 1 & 2\\ 4 & 2 & 5\end{pmatrix}$$

Key in [2ND] [X^{-1}] to enter a matrix.

Go to the rightmost tab 'EDIT'.



For matrix **A**, input the following entries, which denotes our original matrix **A**. As for matrix **B**, key in the identity matrix **I**.

Go to [Y=] to plot a graph.

In the matrix section, go to the middle tab titled 'MATH' and press [1] which indicates the determinant function (yes, determinant is actually a function. The interested can read up Leibniz Formula on Determinants). Key in the following, and each matrix can be keyed in by going to the 'NAMES' tab under the matrix section.

Reflect on what is shown here. X is a variable which represents an eigenvalue of **A**. So, this is actually the characteristic polynomial $\det(\mathbf{A}-\lambda\mathbf{I})$. Finding the roots of this equation yields the eigenvalues! Those who wish to affirm this statement with reference to the example can check that the eigenvalues are $3,\ -5$ and 6.