Question 6

Eigen Values, Eigen Vectors and Eigenspaces

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

The eigenvalues are the solution to the following equation

$$\mathrm{DET}(A - I\lambda) = 0$$

. Equivalently: $\mathrm{DET}(I\lambda - A) = 0$

$$\begin{vmatrix} 0-\lambda & 1 & 0 \\ 0 & 0-\lambda & 1 \\ 0 & 2 & -1-\lambda \end{vmatrix}$$

Computing the determinant

- Pick a row or column (preferably one with lots of zeroes)
- For each element in the row (or column) compute the
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Show that A is diagonalizable over the reals and find the matrix P which diagonalises it. Hence or otherwise solve the system of differential equations

Question 6

Eigen Values, Eigen Vectors and Eigenspaces

$$\begin{vmatrix} 0-\lambda & 1 & 3 \\ 1 & 3-\lambda & 1 \\ 2 & 4 & 1-\lambda \end{vmatrix}$$

Show that A is diagonalizable over the reals and find the matrix P which diagonalises it. Hence or otherwise solve the system of differential equations

Question 7

- Solving a system of Linear Equations
- LU decomposition of a matrix

LU decomposition

$$\begin{pmatrix} 1.000 & -3.000 & 1.000 \\ 2.000 & -5.000 & 4.000 \\ 2.000 & -2.000 & 11.000 \end{pmatrix}$$

Question 7 L matrix

$$\begin{pmatrix} 1.000 & 0.000 & 0.000 \\ 1.000 & 1.000 & 0.000 \\ 0.500 & -0.167 & 1.000 \end{pmatrix}$$

Question 7 U matrix

$$\begin{pmatrix} 2.000 & -5.000 & 4.000 \\ 0.000 & 3.000 & 7.000 \\ 0.000 & 0.000 & 0.167 \end{pmatrix}$$

Define the condition number of a square matrix. Of what is it a measure ? For the matrix A of part (a), use the LU decomposition or otherwise to calculate its inverse, and then calculate its condition number using the maximum row-sum norm.