1, (3 points) Compute the eigenvalues and eigenvectors of matrix 𝐶1 = 𝐶 T 𝐶 ,

First, we get the matrix:

Then calculate the matrix:

Determine the matrix:

Then we can get eigenvalues and

If the eigenvalue , calculate the equation:

Then the eigenvector is:

If the eigenvalue , calculate the equation:

Then the eigenvector is:

2, (3 points) Compute LU Decomposition on matrix 𝐶2

The calculate process of L

The calculate process of U

Define the row with R1, R2 and R3, in the first process, calculate 2R1 + R2, so the value in the L should be -2. Then calculate -3R1 + R3, so the value in the value should be 3, and we are done with LU decomposition:

3, Please compute the CUR approximation. Here we assume the random selection of rows is 3 and 5, and random selection of columns is 1 and 3.